AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

Civilian and Defense

NOVEMBER 15, 1951

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West Coast Aircraft Industry

Austin Introduces "Seven" Model

New Developments at Metal Show

Features of Pegaso V-8 Sports Car

First Turboprop Seaplane Research

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A CHILTON PUBLICATION

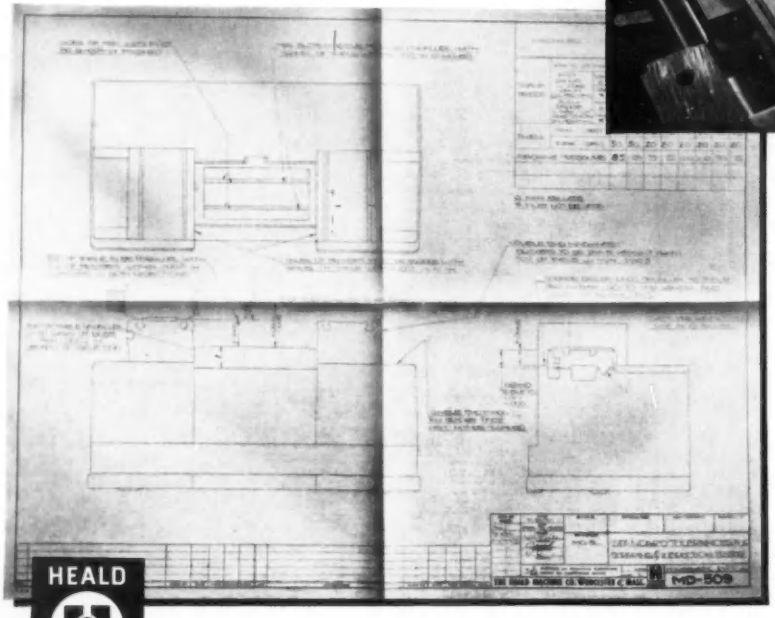
the last .0002 inch is the hardest

...yet no pains are spared to put this extra precision into every Heald machine —so YOU can get more precision out of it

The *best* way isn't always the *easiest*. That's particularly true of the parallelism between the flat and vee table ways and the table pad on a Heald machine. To meet the extremely close manufacturing tolerances that are *standard* for every machine, these table ways are carefully hand scraped by skilled craftsmen. For there is no compromise with *quality* when it comes to building Heald Bore-Matics and Grinding Machines.

True — it means a lot of careful work, and it takes a little extra time. But the results are worth every bit of it TO YOU — in terms of faster, better production, longer machine life, with higher precision and greater accuracy.

Hand scraping puts the finishing touches on the flat and vee table ways of a Heald Bore-Matic.



This blueprint shows the manufacturing tolerances that are *standard* for all Heald Bore-Matics.

HEALD
125 YEARS

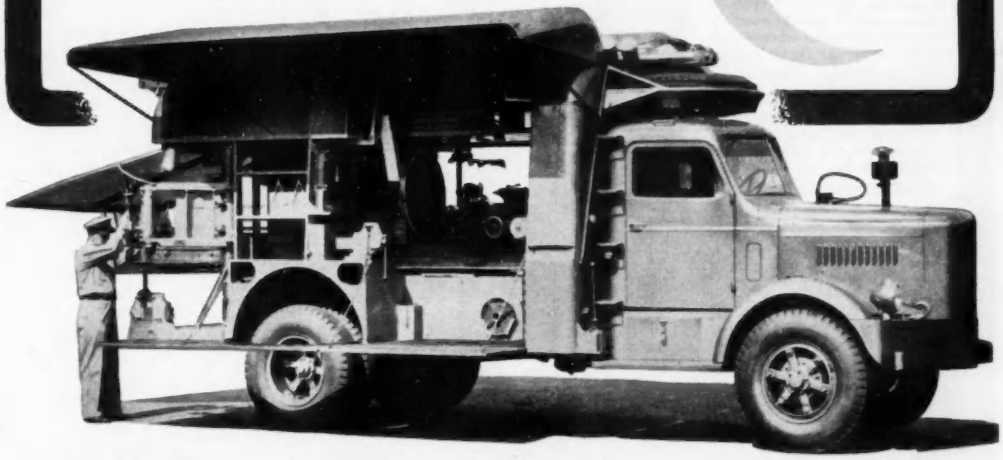
Heald machines speed the nations production

THE **HEALD** MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

taking tools to Turkey

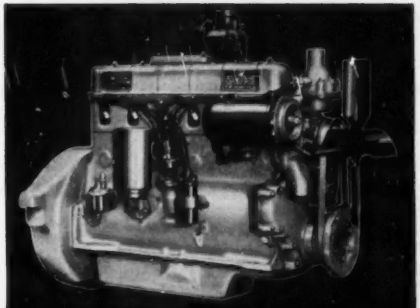


mobile machine shop is powered by

WAUKESHA

● Mobile shop users—military or commercial—need fast rolling power. The power that can take the tools to the job *quick*—and power that can finish the job, too, in an emergency. That calls for Waukesha power. And that's why there's a 195-GKA Waukesha High-Duty Six powering this latest type shop which is now on active duty in Turkey. It's a *Couse* type M shop, mounted on an *FWD* model HA truck chassis. Fully assembled it weighs 23,000 lb.

The Waukesha 195-GKA Six has every modern performance-proved feature—overhead valves, counterbalanced crankshaft with 2⅝-in. main bearings, vibration dampner, aluminum pistons, full pressure lubrication, and many others—all detailed in Bulletin 1513.



195-GKA High-Duty WAUKESHA Engine—six cylinder, 4⅛-in. bore x 4-in. stroke, 320 cu. in. displacement.

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

150

MATTISON
Here is a Mattison three head Vertical Spindle Rotary Automatic Grinder at the Ford Cincinatti Automatic Transmission Plant, finishing converter housings to close limits of accuracy on a real production basis. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation, checking the work and keeping all pieces within specified tolerances without operators attention.
This is only one of the many grinders made by Mattisons. Whatever your surface grinding problem may be, write us for our recomendation on the proper method and machine for your job.
MATTISON
MACHINE WORKS
ROCKFORD · ILLINOIS

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

November 15, 1951 Vol. 105, No. 10

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The use of Tourek Ball Joints—the only recognized standard—frequently brings about simplified design, improved performance and lower costs. A wide range of standard types is carried in stock to assure prompt delivery.

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Stock sizes, available with National Pipe or Dry-Seal threads are: ¼", ⅜", ½", ¾" and 1". Also available on special order in alloy steels, aluminum or brass in sizes up to 2⅝" diameter.

The Tourek plant is one of the largest and most modern in this field. It is equipped with the latest in high speed single and 6-spindle automatics, as well as complete secondary equipment including grinding and brazing. These production facilities—backed by 30 years' experience, assure you "The Best In Quality Screw Machine Products".

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Means More Iron and Steel for You...NOW and in the Future!

How much sheet metal scrap is your plant generating? *How fast* is it finding its way back to the mills, furnaces and foundries in the form of dense, compact bales for the production of new steel and iron?

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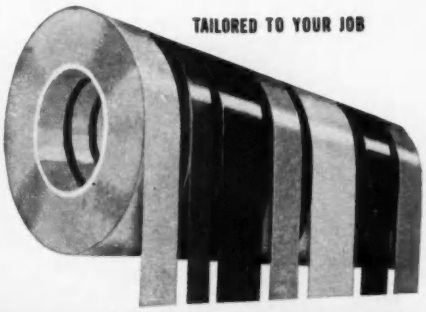
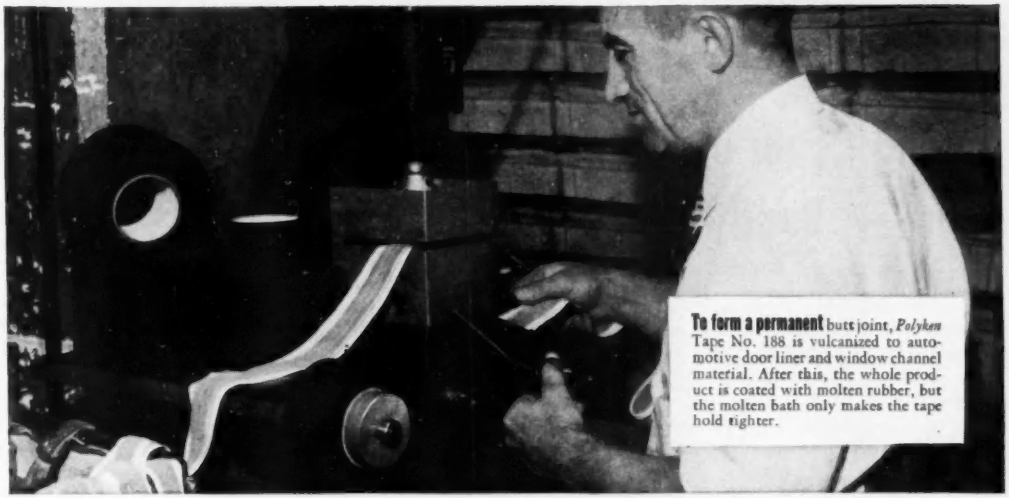
Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB





To form a permanent butt joint, *Polyken* Tape No. 188 is vulcanized to automotive door liner and window channel material. After this, the whole product is coated with molten rubber, but the molten bath only makes the tape hold tighter.

New tape holds fast— even in bath of molten rubber

You'd think a bath of molten rubber would be about as destructive as boiling oil—especially to anything fastened together with tape.

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This is only one of more than a hundred *Polyken* tapes that can serve you in as many different ways. Send in today for free samples and booklet!

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For specifications, samples, and further information on this and other Polyken tapes, please send me your *FREE BOOKLET*, "Tape is a Tool."

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The only tubing double-walled from a single strip, thinner-walled Bundyweld is brazed through 360° of wall contact. It's lightweight, it's leakproof. It resists vibration fatigue; shrugs off stresses and strains, jolts and jars. And despite extra strength, ductile Bundyweld bends smoothly, easily, without structural weakening.

Moreover, Bundy's production techniques prove just as amazing as Bundyweld. Bundy engineers turn out exacting bends to specifications, designing new fixtures when necessary. Your fabricated part is inspected stem to stern and shipped ready for production.

Let Bundy® tubing improve your product. For more specific information, ask a Bundyweld distributor listed below or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

ABOVE: Powerful, rugged 27,500-pound Diesel Crawler in the dependable Allis-Chalmers line. Bundyweld Tubing, double-walled from a single strip, sets performance standards in oil, hydraulic and (above) fuel lines.

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DOUBLE-WALLED FROM A SINGLE STRIP

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Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

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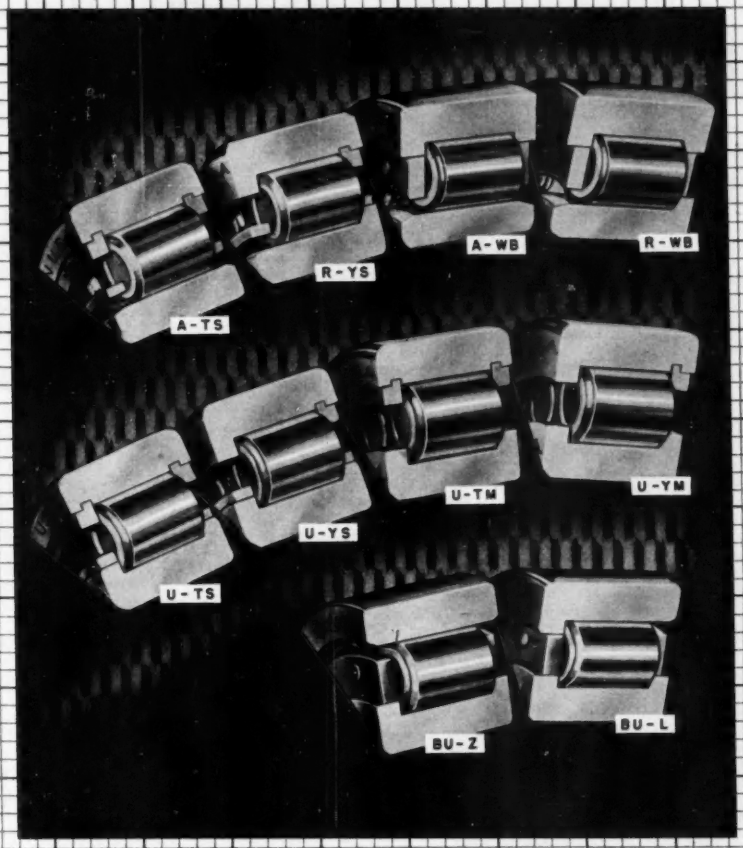

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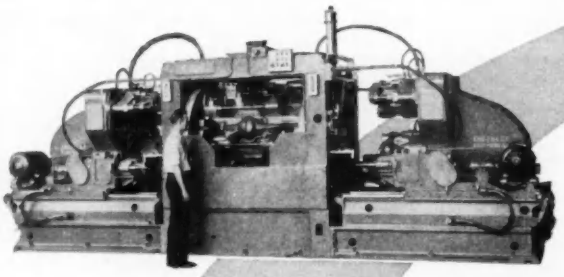
The complete line of Radial Bearings

In the selection of bearings for any application, assembly methods, speed, load, life, shaft location, lubrication, and available space must all be carefully considered.

Accordingly, Hyatt Hy-Load Roller Bearings are made available in ten major types and a full range of sizes because no single bearing type nor small number of types can meet all of the wide variety of design requirements or combination of operating conditions.

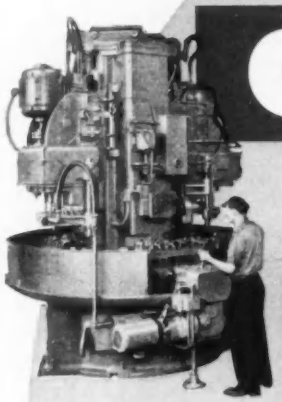
Automotive designers, for years, have made excellent use of Hyatt Bearings in many of their most important applications. The numerous advantages of Hyatts make them the favorite bearings—top-ranking for precision manufacture and enduring quality. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J. and Detroit, Mich.

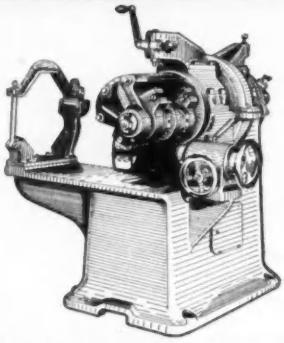
HYATT ROLLER BEARINGS



BUILDERS OF SPECIAL MACHINERY SINCE 1918

GREENLEE





'Way back in 1918, the first Greenlee Special Machine went into operation in the tractor plant of a now famous automobile manufacturer (who still makes tractors). We've made a lot of machines since then, from small, special purpose machines performing only a few operations to huge transfer machines employing several hundred tools working in automatic, unvarying cycles. We're still making special machines . . . and constantly developing new methods for faster, cheaper production processes.

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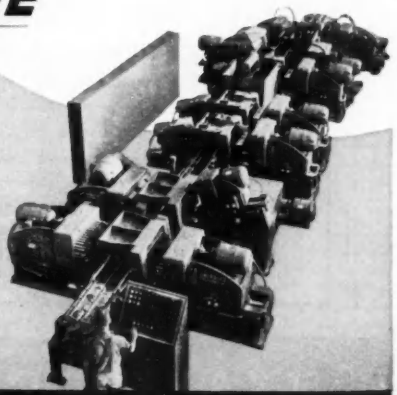

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Ross Congratulates

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Johnson Bus Lines, Inc., Milford, Mass.

Louisville Transit Co., Louisville, Ky.

Palmer Motor Coach Service, Inc., Palmer, Mass.

Portsmouth Transit Co., Portsmouth, Va.

St. Joseph Light & Power Co., St. Joseph, Mo.

St. Louis Public Service Co., St. Louis, Mo.

San Antonio Transit Co., San Antonio, Tex.

Southern Pennsylvania Bus Co., Chester, Pa.

Teche Greyhound Lines, New Orleans, La.

Trenton Transit, Trenton, N. J.

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AGAIN . . . Ross ranks high—with *12 of the 17* makes of equipment operated by the award winners *steered by ROSS*. To all of them . . . and to the operators and manufacturers of the many other types of vehicles in America's vital, motorized transport system—*Ross extends congratulations for a job well done.*

The Ross policy of incorporating advancements in design as they are proved by exhaustive tests has resulted in many recent improvements. Current Ross models have:

(1) *Increased mechanical reduction* . . . (2) *More compactness* . . . (3) *Reduction in weight* . . . (4) *Greater arm angular-travel* . . . (5) *Improved metallurgy* . . . (6) *Increased efficiency.*

Throughout 44 years of leadership in this industry, Ross Gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of safety, stability and performance. We invite discussion of any steering problem.

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Cam & Lever **STEERING**

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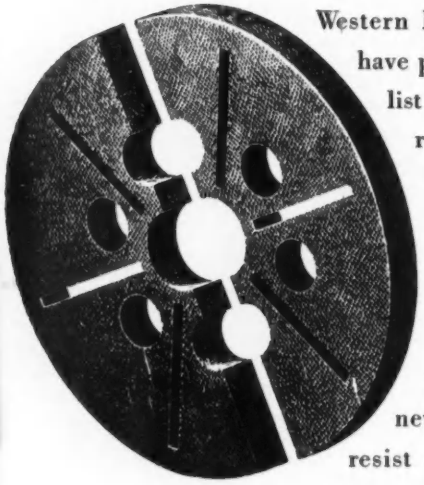
P.V.* APPROVAL

*Plus Value



Western Felt users over a long period of years have placed their stamp of approval on a long list of its products. They know from experience the "plus value" in every Western Felt component part. Highest precision in its processing and cutting produces a uniformity that minimizes rejections—prevents failure of the finished product from felt causes. They are available from wool softness to rock hardness—never lose shape—do not ravel or fray—resist oil, water, age—are resilient, flexible, compressible—may be cut to close tolerances.

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MANUFACTURERS AND CUTTERS OF WOOL FELTS

SQUEEZE PLAY

35 ton "Hy-Power" Riveter attaching brake backing plate assembly to rear axle housing with cold rivets.

. . . on assembly costs

Yes, you can really put a "squeeze play" on assembly and production costs with a Hannifin silent-squeeze "Hy-Power" Riveter. It can take over your riveting operations—and many types of pressing, punching, forming and bending jobs—do them silently with push-button ease and efficiency that up production, reduce cost.

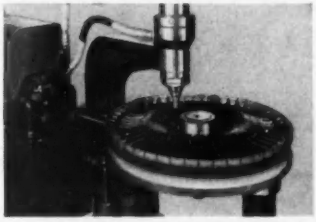
Heart of the "Hy-Power" hydraulic system is the unique "Hy-Power" Generator—a combination of motor, pump, oil reservoir, control valves and high pressure intensifier assembled as a compact, self-contained unit.

It powers the "Hy-Power" Riveter—the work tool that silently forms cold rivets at the touch of a button.

For a thorough discussion of how "Hy-Power" equipment can be utilized best in your plant, ask to have a Hannifin field engineer arrange an appointment with you.

Also, WRITE FOR YOUR COPY OF BULLETIN 150—"*Hy-Power*" *Hydraulics* Hannifin Corporation, 1143 S. Kilbourn Avenue, Chicago 24, Illinois.

One man handles this 50-ton "Hy-Power" Riveter with effortless ease in working on railroad car underframes.



A stationary "Hy-Power" Riveter joins hub and runner assembly of hydraulic couplings.

do ALL you CAN do . . . with

HANNIFIN

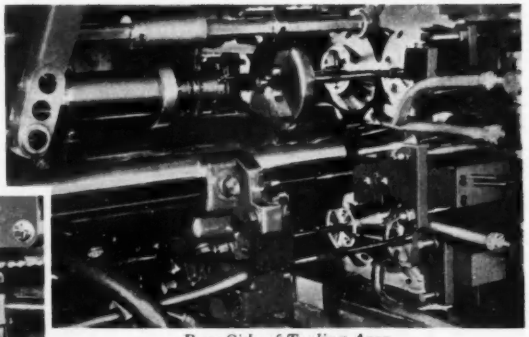
Air Cylinders • Hydraulic Cylinders • Hydraulic Power Units • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Units • Air Control Valves

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

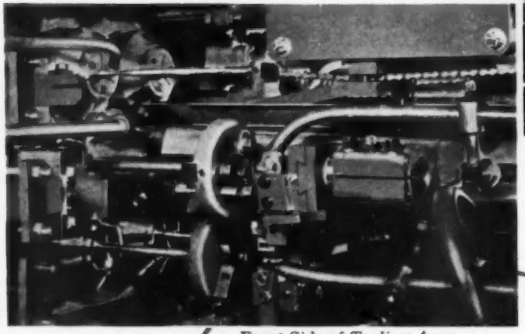
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for *any* type of job.

*You can have the figures

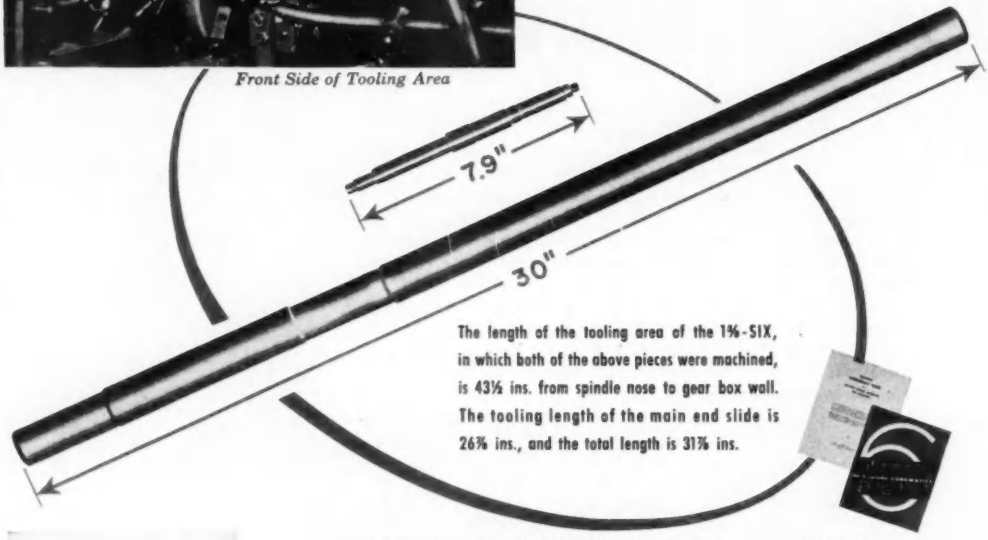
THERE'S *More* THAN JUST *"Elbow Room"*



Rear Side of Tooling Area

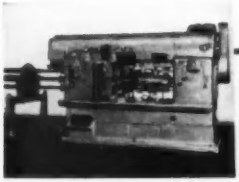


Front Side of Tooling Area

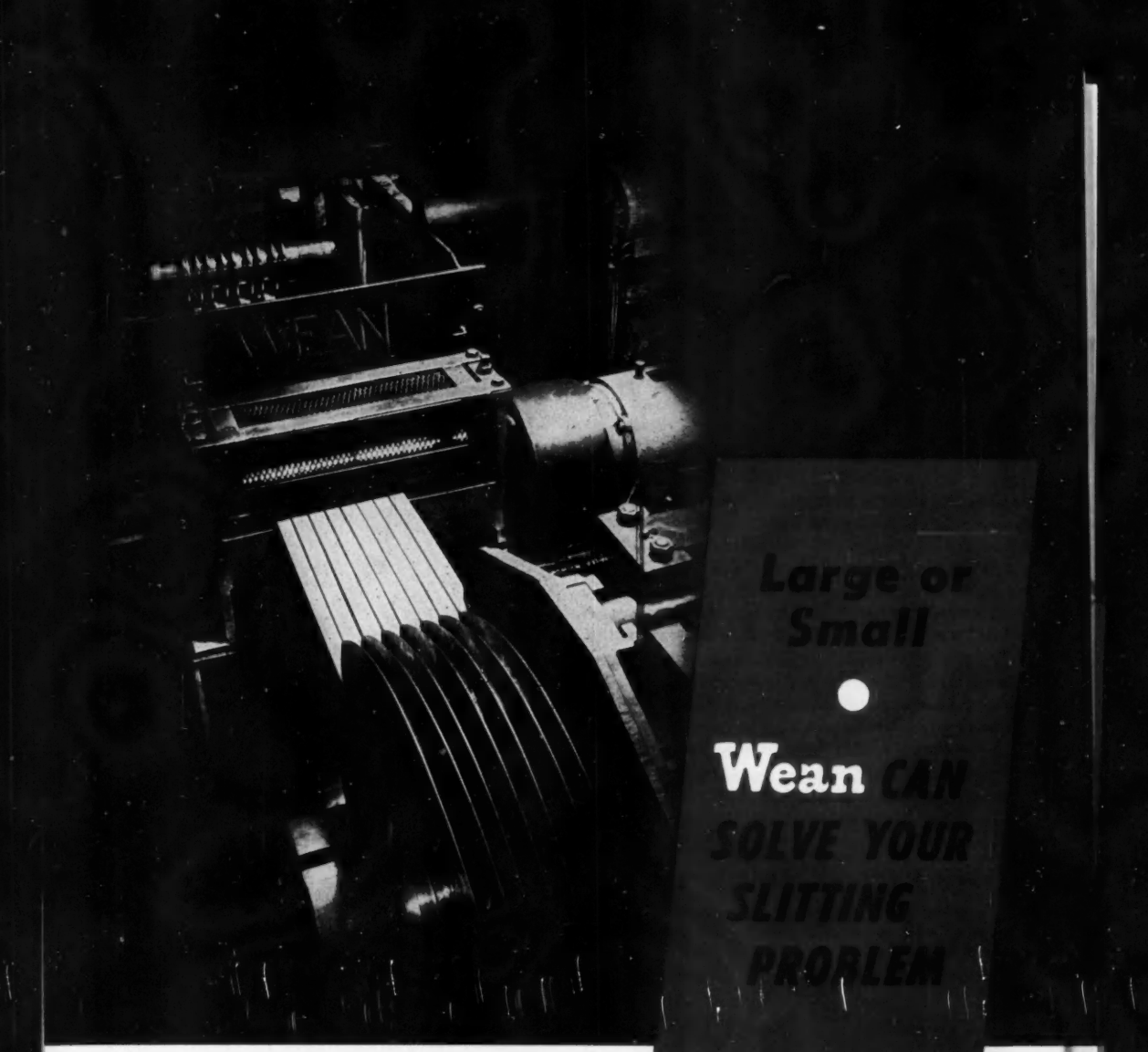


The length of the tooling area of the 1⅛-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26⅝ ins., and the total length is 31⅞ ins.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



If you are in the business of handling strip steel or fabricating steel parts or products from strip steel you should give your slitting operation high consideration.

Well designed slitting lines enable you to reduce inventories, lower labor costs and eliminate expensive extras. Wean engineered slitting lines give you these important factors at lowest initial costs.

If you have a slitting problem—or merely desire a check on the efficiency of your present operation—call in Wean specialists.

Wean *Equipment Corporation*

CLEVELAND, OHIO

The Sign OF SMOOTH, SURE STOPS!

THE INDUSTRY'S FINEST POWER BRAKING SYSTEMS

More than two and a half million installations have made Hydrovac the undisputed leader in the field of power braking. And now Bendix Products offers Air-Pak, an air-hydraulic unit similar in design and principle to the Hydrovac. Air-Pak changes air pressure into hydraulic pressure by means of two direct connected pistons, thus combining all the well proven advantages of hydraulic brake action with an air brake system.

Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a safety factor of tremendous importance.

Remember, regardless of size of vehicle or whether your preference is for vacuum or air brakes, for the industry's finest power braking systems be sure to specify Bendix® Hydrovac® or Bendix Air-Pak.

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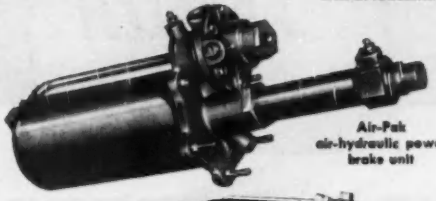
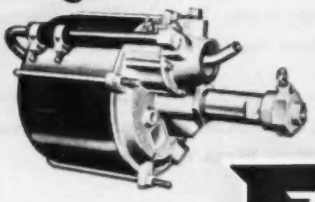
Bendix AVIATION CORPORATION



Air-Pak air-hydraulic power brake unit



Hydrovac vacuum-hydraulic power brake unit

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Bendix Products Division

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High Spots of This Issue

Spain's New Pegaso Car

This new sports model is Spain's first postwar passenger car. It is produced by the nationalized E.N.A. SA. Its interesting mechanical features are described and illustrated. Page 32.

Unit Assembly of Wings With 50,000-Lb Fixture

The largest wing fixture ever designed by Convair is a steel structure 108 ft long. It is used in making wings in one section for the 44-passenger Convair-Liner 340. See page 36.

Largest Metal Show in History

The 33rd National Metal Congress and Exposition held simultaneously with the First World Metallurgical Congress, registered the record attendance of 45,000. Abstracts from some of the excellent papers presented there are included in this extensive article. Page 38.

The West Coast Aircraft Industry

"Booming" indeed is the industry of the West Coast Aircraft manufacturers. With a backlog of over $5 billion in orders, tremendous expansion programs are underway. This complete report gives facts and figures of unusual interest and value. Page 42.

World's First Turboprop Seaplane

From Convair's Hydrodynamics Laboratory comes the fascinating story of how research with radio-controlled scale models produced the World's first tourboprop seaplane. Turn to page 48.

30 New Products Items And Other High Spots, Such As:

The new Austin model presented at the British Automobile Show; figures on how the 1951 vehicle registration will exceed 51.4 million; building and testing Caterpillar Diesel engines; the Business Pulse; an aircooled Diesel engine for aircraft; an interesting heat exchanger setup; the expanding titanium industry; Defense contract awards; and new Defense facilities.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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News of the AUTOMOTIVE INDUSTRIES

Vol. 105, No. 10 November 15, 1951

NPA Forbids Major Car Model Changes After Feb. 1

In a sweeping order issued recently, the National Production Authority banned major model changes in automobiles after Feb. 1, 1952. The often-predicted freeze is, of course, designed to enable a greater output of machine tools for armament and other defense production. The order will presumably not affect 1952 models, for which tooling is well under way, and permits manufacturers to obtain replacements for worn-out tools. Furthermore, they will still be able to make whatever minor changes are possible with existing tools.

Under the order, which also applies to other durable consumer goods such as washers, television sets, and refrigerators, priority ratings for machine tools will be given only to companies operating at a government-authorized production rate higher than they were in the first quarter of 1951. In placing a lid on machine tools shipments for unrated orders after Feb. 1, an exception was made in the case of a machine tool producer whose output on rated orders is below 70 per cent of his average production in te first six months of 1950. At the same time, the NPA revoked a previous order which provided priorities for machine tool builders having pool orders to enable them to get first call on raw materials.

North American to Produce New Sabre Jet Models

North American Aviation has announced orders from the U. S. Air Force for the production of two advanced models of the F-86 Sabre jet. The new models, designated as F-86F and F-86H, will be produced early next year at the company's plants in Columbus, O., and Los Angeles, Calif., respectively.

Both planes will have more powerful General Electric J-47 jet engines and attain speeds of over 650 mph. While details are not available at the present time on the F-86F, it is known that the F-86H will be slighly larger than the current F-86E, incorporate an improved suspension and release mechanism for carrying droppable wing tanks in conjunction with bombs or rockets, have .50 caliber machine guns, and an improved type pilot seat ejection mechanism.

Chrysler Unveils Surprise Experimental Sports Car

One of the most interesting exhibits in Chrysler Corp.'s display of engineering developments in Detroit, Nov. 8, was an experimental sports car powered by a V-8 overhead valve engine developing 310 hp at 5200 rpm without supercharger and requiring only standard premium grades of gasoline. Designated as the K-310, the engine is an evolution of the V-8 firepower unit with modifications in valves, intake ports, camshaft, manifolding, carburetion, and a slight increase in compression ratio to eight to one.

The car, which also bears the designation K-310, is sleek, wide, and low with continental styling. It is built on a chassis produced in Detroit and shipped to Italy, where the car was completed by the GHIA Works from a three-eighths plaster model with drawings supplied by Chrysler. Utilizing Chrysler fluid torque drive, the car has 17 in. wire wheels and an inside trunk lid control. The spare tire, which is recessed into the floor of the trunk, swings up and out of the trunk on spring-loaded support arms.

Chrysler Corp. has no present plans to build the car as a production model. K. T. Keller, board chairman, has stated that considerable testing must be done and that it must yet be determined whether or not the car could be built and sold in limited volume at a price that would warrant placing it in production. At any rate, he said, production tooling could not be justified, and the car would have to be built on a custom basis.

The car was shown in connection with a press showing of the company's 1952 models, together with a display of defense assignments and previously highly secret experimental projects. Also exhibited was the new 160-hp overhead valve V-8 engine scheduled for use in DeSoto models some time next year. Chrysler revealed that it has 12 major transmission programs under development and included in the display were: a fully automatic transmission with torque converter and planetary gearing, a transmission similar to the fluid torque unit used on current Chrysler models but with oil for the converter supplied by the engine oil system rather than from an independent supply; an electromagnetic automatic passenger car transmission; and an electromagnetic marine reversing gear.

Among other developments shown were: hydraulic tappets, power brakes, power steering, a new electric seat adjuster, electric window lift, cowl-vent heater, and a high-frequency condenser discharger system. Finally, defense products on display included: a cargo carrier, ambulance, military trucks, air raid siren, the J-48 turbo-Wasp jet aircraft engine, submarine nets, aircraft subassemblies, and four-bladed steel propellers.

OPS Approves Prices For New Willys Car

The Office of Price Administration has revealed that it has approved wholesale prices ranging from $1310.25 to $1468 on the new Willys-Overland passenger car. To these prices must be added the dealer's discount, transportation charges, federal, state, and local taxes, registration fees, handling and preparation charges, and any accessories that the customer wants. A delivered price of $1700 to $1800 is indicated.

The car will be powered by a six-cylinder F-head, 90-hp engine. It is only slightly shorter in wheelbase than current standard cars in the lower-priced field, has a roomy interior, and is excellently styled. The company has adequate production space to produce the new passenger car without affecting output of the regular Willys line of utility vehicles. Where the steel is coming from is not immediately clear, but it is indicated that the National Production Authority will grant materials under the provision of the law that recognizes the importance of new products. Also, there is some possibility that, beginning with the second quarter of 1952, Willys' percentage of industry allotment will be increased somewhat to take care of the passenger car requirements.

MAMMOTH JET PLANE

Upon completion of the 145-ton Princess flying boat, which will be launched at the end of 1951, the English firm of Saunders-Roe will start work on a larger plane, the Duchess, with six dual jet engines, shown above. The latter will reportedly be the largest ever built.

Tuthill Spring Starts Operation of New Plant

The Tuthill Spring Co., Chicago, manufacturer of leaf springs, is now operating its new plant in Momence, Ill. The new modern building is 60 ft by 330 ft.

Chrysler Gets Propeller Job For San Leandro

The new 750,000 sq ft addition being built to Chrysler Corp.'s San Leandro, Calif., plant will be used for production of Hamilton Standard propellers for the Navy. Chrysler has been given a multi-million dollar contract to build the propellers under an engineering assistance and license agreement with Hamilton Standard Div. of United Aircraft Corp. The propeller job will not interfere with production of Dodge and Plymouth cars and Dodge trucks at the plant. All major assemblies will be produced at the San Leandro plant, with parts being supplied by a large number of other companies.

More than 1000 individual parts go into the propeller, which has four hollow steel blades, is fully reversible and hydraulically operated. It weighs 745 lb and measures 16½ ft from tip to tip. The license is granted to Chrysler by Hamilton Standard without fee or royalty. In addition to the plant now under construction, a 30,000 sq ft auxiliary building will be erected to house two horizontal 400-ton presses for "hot forming" cores and shells of the propeller blades.

Graham-Paige Acquires Sterling Engine Stock

Joseph W. Frazer and Graham-Paige Corp. are back in the automotive news again with the announcement that Graham-Paige has acquired 32 per cent of the prior preferred stock of Sterling Engine Co. of Buffalo. Frazer, who is chairman of Graham-Paige, was elected chairman of the board of Sterling. The stock acquired by Graham-Paige consists of 40,040 shares, which constituted the entire holdings of Baldwin-Lima-Hamilton Corp. It represents the largest single block of stock in the company, which was founded in 1901 and manufactures Diesel and gasoline engines.

Packard Defense Work In Volume Year Away

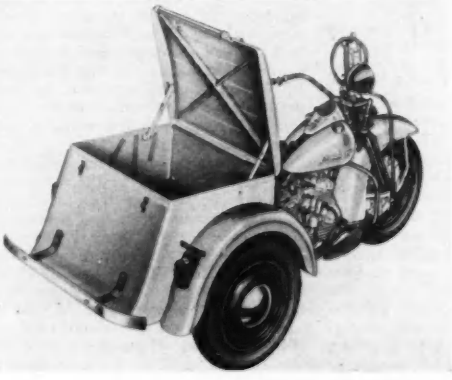
Although Packard Motor Car Co. has approximately $300 million worth of defense contracts at present, it will be the middle of next year before production in any volume will get rolling, according to Leroy Spencer, executive vice-president. He told a press conference in Detroit recently that defense work will be going at the rate of $300 million a year by the end of 1952 and probably would be hitting a half billion dollar rate by the end of 1953.

Spencer went on to say that the company has been able to reduce the amount of copper used in its automobiles from 55 to about 43 pounds by opening up the front end of the car, permitting use of lighter gages in the radiator and by reducing wire gage by two numbers. He also stated that Packard is testing copper-clad steel fins for radiators, but as yet has not come up with anything that is satisfactory. Furthermore, the company is doing considerable work with aluminum as a substitute for copper, particularly in wiring, but manufacturing processes must be developed before it can be successful.

Thirdly, he said that Packard already is using nylon gears in a few light service applications, and their further use is contemplated. Finally, he reported that Packard is working on 1953 models and indicated that styling changes would be forthcoming about a year from now.

Keen Interest Seen in Plastics Show

The Society of the Plastics Industry, Inc., the sponsoring body, has reported that interest in the Fifth National



THREE-WHEEL ERRAND BOY

This 1952 Harley-Davidson Servi-Car is outfitted for car pick-up and delivery. Its body load capacity of 500 lb is said to make this three-wheeled vehicle suitable also for such duty as tire and battery emergency service calls.

INDUSTRIES

MOBILE PLASTIC REFRIGERATOR

Introduced at the recent American Trucking Association convention in Chicago, the Pressed Steel Car Co.'s new Unicel refrigerator truck-trailer of cellular plastic-laminated plywood construction was built for the Brown Equipment & Manufacturing Co. The unit has an overall length of 32 ft with a capacity of 1735 cu ft and a load capacity of 40,000 lb. It is 7 ft 6¾ in. wide and 7 ft 5⅞ in. high.

Plastics Exposition, to be held in Philadelphia, Pa., March 11 to 14, 1952, has been most encouraging. Exhibitors will include plastics manufacturers, fabricators, molders and laminators, manufacturers of machinery and equipment, and firms representing scores of industries whose products involve the use of plastics.

GM Gets Plane Order For New Texas Plant

GM will build a new dual-purpose plant at Arlington, Tex., to be used initially for production of aircraft. GM has a letter contract to produce an airplane designed by Grumman. Construction of the new plant will begin soon, and completion is scheduled for early in 1953. Tooling for the plane contract will begin immediately. Civilian production planned for the new plant will consist of the assembly of Buick, Oldsmobile, and Pontiac cars, but there is no indication as to when it might go into operation.

Chevrolet Observes 40th Anniversary

The 40th anniversary of Chevrolet on Nov. 3 was observed quietly. Today, Chevrolet is the largest single builder of passenger cars and trucks, and will have 12 million vehicles on the road by the end of this year. Currently the division operates 28 plants in 20 cities, in addition to three government plants which are used for production of shells, transmission gears, and aviation engines.

Hudson Awarded Fourth Aircraft Contract

Hudson Motor Car Co. has received a contract for tooling and manufacture of forward sections of the B-47 Stratojet Bomber from the Tulsa Div. of Douglas Aircraft Co. The contract is the fourth aircraft job awarded to Hudson this year and the second in connection with the B-47. For reasons of military security, the dollar value of Hudson's contracts has not been revealed.

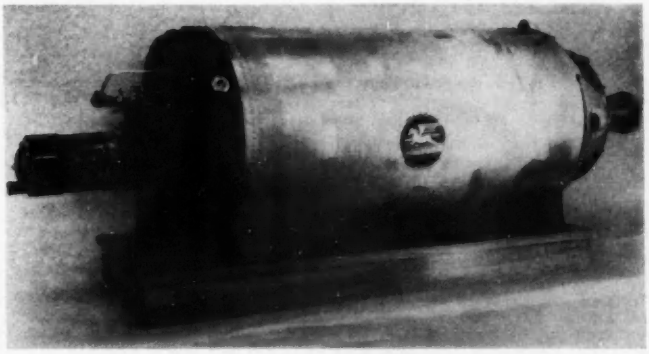
1952 Packard Prices Raised $59 to $105

Packard Motor Car Co. has increased its prices coincident with the introduction of its 1952 models. The price increases amount to about $59 on seven models, and $105 on one model. The new prices include the new three per cent increase in excise taxes, but do not reflect higher labor, material, or model changeover costs. Price of the Ultramatic drive was increased only by the additional excise tax which brings it to $189. The company also revealed that the price of the optional "Easamatic" power brake unit will be $39.45.

New prices of the 1952 "200" models, delivered in Detroit, state and local taxes extra, are: Club Sedan, $2475, up $58.93; Touring Sedan, $2528, up $58.95; Deluxe Club Sedan, $2622, up $59.23; Deluxe Touring Sedan, $2675, up $59.24; Mayfair, sports hardtop, $3293, up $59.03; Convertible, $3450, up $59.35; the "300," $3094, up $59.87; and the Patrician "400," $3767, up $105.44.

A.F.S. Prepares for 1952 Gathering

The American Foundrymen's Society has commenced full-scale preparations for the 1952 International Foundry Congress and Show in Atlantic City, N. J., May 1 to 7. An attendance of more than 15,000 foundrymen, including several hundred from abroad, is expected at this 56th Annual Meeting of the A.F.S. to view a wide variety of exhibits and take part in numerous technical discussions.



SMALL JET ENGINE

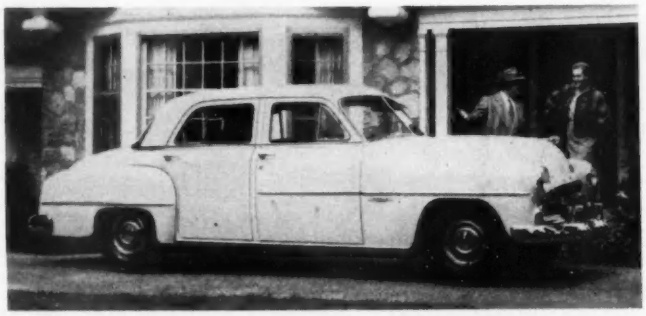
Pictured above is the new J-44 turbo-jet engine being produced by the Engine Div., Fairchild Engine and Airplane Corp., for the U. S. Navy and U. S. Air Force. The engine, which is approximately six ft long and 22 in. in diameter, weighs 325 lb with complete accessories and develops a thrust of 1000 lb. Construction details, specific performance data, and applications for the engine have not yet been revealed.

WSB Rejects Increase In Tool, Die Rates

Tool and die worker wage rates will continue to be controlled by the same general wage regulations covering other industries, following rejection by the Wage Stabilization Board of a proposal that wage ceilings for such workers be increased by $.30 to $.88 an hour. A recommendation was made by a special board panel to prevent pirating of skilled workers by employers who could pay higher wages. Industry and public members of the board defeated the proposal on the grounds that it would be inflationary, would mean special treatment for a small special group, and that the risks involved outweighed the possible advantages.

USAF Undertakes Press Program

The U. S. Air Force has inaugurated a program of design, construction and operation of heavy forging and extrusion presses to expedite the manufacture of aircraft, conserve materials in short supply and reduce costs of fabrication. Under the program, which is expected to cost $210,000,000 over the next four years, 20 presses will be installed in a number of special plants serving the aircraft manufacturing industry. Firms presently scheduled to operate presses are: Wyman-Gordon Co., Aluminum Co. of America, Harvey Machine Co., Kaiser Aluminum and Chemical Co., Bohn Aluminum and Brass Co., Curtiss-Wright Corp. and Reynolds Metals Co.



1952 DODGE CAR

Styling refinements inside and out and, as an optional feature, greenish tint safety glass are features of the 1952 Dodge cars. Exterior changes include modifications in the design of the front grille, new wheel covers and hub caps, a new tail light assembly, and modified rear fender trim. New upholstery fabrics, an instrument panel with a non-reflecting finish, a new steering post cover, and new air conditioner controls make up the interior improvements and refinements. Gyro-Matic will be available on all models in the 1952 line. All models will have waterproof ignition systems, electric windshield wipers and Oriflow shock absorbers. Eight models will make up the new Dodge line. Two models, the Wayfarer Sportabout and the Coronet eight-passenger sedan, have been discontinued.

Goodyear Sets Up Branch in Japan

The Goodyear Tire & Rubber Co. has announced the formation of a sales company known as Goodyear Japan, Ltd., to manufacture and sell tires and other products in Japan. Main offices of the new company are in Tokyo, but production operations will be carried on in Kurume, Japan, under contract with the Bridgestone Tire Co., a Japanese concern.

AiResearch Mfg. Co. Wins $36 Million Order

A $36 million contract for small gas turbine engines has been awarded to AiResearch Manufacturing Div., The Garrett Corp. The Navy Bureau of Aeronautics order represents partial auxiliary gas turbine production released from 1952 funds and specifies auxiliary gas turbine engines, air turbine starters, and control valves for seven types of Navy turbojet and turboprop aircraft. Production will be carried on in the company's Los Angeles plant and its newly expanded Phoenix, Ariz., facility.

Garrett recently announced a net profit of $1,873,099 from consolidated sales of $33,056,585 for the fiscal year ended June 30, 1951. This compared with the previous year's sales of $22,204,909, which yielded net earnings of $2,043,372.

1952 DE SOTO

In the new 1952 De Soto custom four-door sedan, shown above, the hood ornament is longer vertically and shorter horizontally, the name of the car is spelled out in single block letters in place of joined script letters, and the combined stop and back-up lights have a single instead of a double cross bar. Nylon fabric instead of wool is being used for the upholstery.

Fred S. Roberts Elected President of NSPA

Fred S. Roberts, president and general manager of Phelps-Roberts Corp., was elected president of National Standard Parts Association at the organization's recent convention in Chicago, Ill. Charles A. Klaus, sales director of Maremont Automotive Products, Inc., was named senior vice president, while Luther Bachman, president and general manager of Bee, Inc., was chosen junior vice president.

Martin B-57A Canberra to be Powered by Sapphire Jet

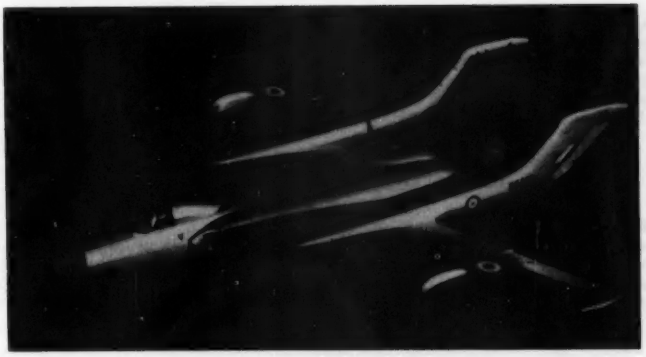
The U. S. Air Force recently revealed that Sapphire turbojet engines, built by the Wright Aeronautical Co. under license from Armstrong Siddeley Motors, Ltd., will power the Glenn L. Martin Co.'s twin-jet B-57A Canberra, a number of which are being built for the USAF. The engine, designated J-65-W-1, has a rated thrust of 7200 lb. The same internal design as that employed in the original engine will be used, but the accessories will be rearranged considerably to conform to American standards.

Ford to Have New Bodies in 1952

Ford Motor Co. will have new bodies on all three of its passenger car lines and two new engines when it introduces its 1952 models starting early in January. The Lincoln and Ford Six will have new engines, but plans for new V-8 power plants for the Ford and Mercury have been postponed because of tooling difficulties.

Italian Motor Show Set for 1952

The Council of the Italian Automobile Manufacturers Association has reversed its previous decision not to hold the Italian Motor Show next year. The 34th International Motor Show will be held in Turin from April 23 to May 4.



ROUND-THE-CLOCK FIGHTER

This De Havilland 110, snapped after sundown on its second flight, is the first of a new class of twin-engine, day-and-night fighters designed to meet the special requirements of the British Royal Air Force. It is equipped with two Rolls-Royce Avon engines and carries modern electronic and navigation aids.

Olds Factory Dealers Push Scrap Drive

Oldsmobile Div. of General Motors Corp. is taking a very active part in the national scrap drive. The division has not only turned in nearly 1900 tons of non-production scrap, but has actively promoted a drive among its dealers which has resulted in collection of nearly 5600 tons of scrap. The dealer contribution consists of scrap metal, junked automobiles, obsolete equipment, and machinery.

Ford Motor Co. of Canada Plans Big Assembly Plant

Ford Motor Co. of Canada has announced that it will build an automobile assembly plant with an area of 1,400,000 sq ft at Oakville, 20 miles west of Toronto, Ont. The plant will ultimately be used to assemble all cars and trucks produced by the company in Canada. Simultaneously, the present assembly plant at Windsor, Ont., will be converted into a huge engine plant, and several million dollars will be used to expand machine shop and foundry facilities.

ONE-PIECE GIANT

This one-piece, 32-ft length of wing section for Lockheed Super Constellations is said to be the largest single piece of wing ever fabricated, and will reportedly make planes stronger without adding weight.

Air Force Leases Machine Tools for Defense Work

Army and Navy contractors and subcontractors have been invited by the U. S. Air Force to lease about 5000 reserve machine tools stored in depots at Marietta, Ga., and Omaha, Neb. Gear machines, grinding machines, and welding equipment constitute the bulk of the tools.

MPR-Thompson Products Merger Seen Uncertain

Although stockholders of Muskegon Piston Ring Co. have approved a proposed plan of merger with Thompson Products, Inc., there still is a possibility that the consolidation may not be carried out. Stockholders gave the directors authority to proceed with the merger, defer completion, or abandon the proposal, if preliminary government objections are upheld. The Justice Department already has ques-

tioned the merger on the grounds that it may violate the anti-trust law. Managements of both companies will continue their studies before making a final decision. Another meeting to discuss the merger will be held Nov. 27.

Fargo to Produce Navy Ambulances

A contract has been awarded to the Fargo Motor Corp. for 281 new type ambulances for use at U. S. Navy installations. The new vehicles will replace worn-out World War II field ambulances now in use.

Bendix Red Bank Div. Expands Greatly

Bendix Aviation Corp.'s Red Bank, N. J., Div. has nearly completed an expansion program which will increase its manufacturing facilities appreciably. A new plant of 70,000 sq ft at nearby Eatontown, N. J., will be used for the production of non-rotating electrical equipment. Non-rotating equipment will continue to be made at the main plant in Red Bank, while a third plant in Long Branch, N. J., will wind coils and armatures for all of the division's requirements.

Amyl Nitrate Studied As Diesel Fuel Aid

A report on tests now being conducted by the U. S. Navy with Diesel fuels using amyl nitrate as an additive to increase the cetane number is expected within two or three months. It is understood that results have been very encouraging and that there is a good chance that the amyl nitrate additive may be made available commercially in the not-too-distant future. One advantage is that a more uniform diesel fuel in respect to cetane rating could be made available throughout the country.

There also is some opinion that compounds other amyl nitrate may be developed as Diesel fuel additives. Ethyl Corp. also has been testing amyl nitrate and reports that ignition quality of Diesel fuels fortified with amyl nitrate compares favorably with that inherent in a clear fuel of the same cetane number for a wide range of operating conditions.

1951 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Totals 1951	Totals 1950
First Quarter	1,601,853	378,312	2,011	1,980,176	1,037,489
Second Quarter	1,497,005	410,280	2,399	1,909,684	2,112,818
Total—Six Months	3,098,858	788,592	4,410	3,889,860	3,750,307
July	381,407	110,244	665	492,316	706,702
August	426,932	121,993	783	549,708	816,123
September	365,906	109,353	743	476,002	722,943
Third Quarter	1,174,245	341,590	3,191	1,518,026	2,247,668
Total—Nine Months	4,273,103	1,129,182	6,601	5,407,886	5,997,975

1951 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
First Quarter	164,304	70,998	26,073	67,689	18,099	18,706	10,443	376,312
Second Quarter	174,654	73,986	33,930	77,002	18,915	21,493	10,320	410,280
Total—Six Months	338,958	144,984	60,003	144,691	37,014	40,199	20,763	786,592
July	45,774	21,238	7,432	22,312	4,796	5,717	2,973	110,244
August	50,304	22,689	7,412	24,071	6,638	7,215	3,664	121,993
September	43,380	20,244	6,848	24,004	5,645	5,370	3,862	109,353
Third Quarter	139,458	64,171	21,692	70,387	17,081	18,302	10,519	341,590
Total—9 Mos. 1951	478,396	209,135	81,695	215,078	54,095	58,501	31,282	1,128,182
Total—9 Mos. 1950	476,478	198,556	71,544	164,816	39,753	33,594	21,259	1,006,000

*—Automobile Manufacturers Association.

OPS Grants Increase In Henry J Price

OPS has granted approval to Kaiser-Frazer Corp. for a 6.34 per cent increase in the price of the Henry J. K-F says it has no present plans to put the higher prices into effect. The increase would apply at the factory wholesale level and applies to extras, special, and optional equipment as well as to the car itself.

General Motors of Canada to Build Winnipeg Plant

General Motors of Canada, Ltd., will build an assembly plant and parts depot in Winnipeg, Man. The development will cover a 100-acre site and will cost in excess of $2,500,000.

Fairchild to Construct Plant on Long Island

The Fairchild Camera and Instrument Corp. recently announced that it will build a $3,000,000 war plant this year at Jericho, L. I., N. Y. The output of the four and a half acre plant will be devoted entirely to defense orders for aerial cameras, radio direction-finders and other essential material for the armed forces.

Studebaker Earnings Cut More Than 50 Per Cent

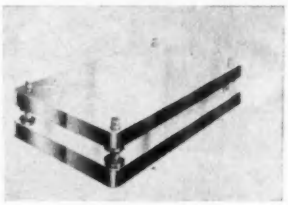
Higher costs, frozen prices, and the results of government restrictions on production are reflected in net earnings of Studebaker Corp. for the first nine months of this year. Profit for the period was $8.8 million, a drop of more than $10 million from a similar period in 1950.

Rezolin Builds Plant In Los Angeles

Rezolin, Inc., manufacturers of Rezolin tool plastic for automotive and other industrial uses, is building a 13,000 sq ft office and factory building in Los Angeles, Calif., at a cost of $225,000. It will contain complete tool fabrication facilities for the making of plastic dies, jigs and fixtures, in addition to administration, engineering and production departments.

Vanadium Corp. Leases Tungsten Mill

Vanadium Corp. of America has leased a tungsten mill at Nederland, Colo., from Hetzer Mines, Inc. The former will enlarge the capacity of the mill in order to process tungsten ores in the area.



MIGHTY DIE SET

This large die set, made by the E. A. Baumbach Mfg. Co., Chicago, is 50 in. wide, 100 in. long, and weighs approximately 10,000 lb. It was delivered recently to Willys-Overland for stamping fenders and hoods.

Higher Excise Taxes Boost Car Prices

Automobile and truck manufacturers have generally increased prices to include the three per cent rise in excise taxes voted by Congress. The Automobile Manufacturers Association reports that on a $2000 car the excise tax will increase from $102.25 to $146. It is estimated that total taxes of all kinds on a $2000 automobile now amount to $628 or 31.4 per cent of the selling price. Before the rise in excise taxes, total taxes on such a car were estimated at $584.25. The excise tax increases in the automobile industry run from about $30 on the Henry J to $131.50 on the Chrysler Crown Imperial, eight-passenger limousine. The increase applies not only to automobiles and trucks, but also to accessories such as automatic transmissions and to repair parts.

Canada Seeks British Aid In Jet Engine Shortage

In an attempt to overcome a critical shortage of jet engines, the Canadian Government is negotiating with British manufacturers of the Rolls-Royce Nene III engine. The plan is to bring British technicians to Canada to set up production of the Nene engine alongside assembly lines at the Avro plant, Malton, Ont., where the Canadian Orenda jet engine is under production.

G. M. Nine Months Net Shows Big Decline

GM's profits for the first nine months of this year reflect lower volume, higher taxes, higher costs, price controls, and the lower margin of profits on defense work. How seriously these factors have affected GM's earnings is shown in a comparison between the nine months' figures for 1951 as compared with last year. Earnings this year were $373 million, or just slightly more than half of the $703 million earnings in the first three quarters of 1950. Furthermore, earnings for the first nine months of 1951 amounted to 6.7 per cent of sales, compared with 11.1 per cent for 1950.

Taxes, Costs, Controls Halve Chrysler Net

Despite an increase of nearly one-half billion dollars in sales for the first nine months of this year as compared to the same period a year ago, Chrysler Corp.'s earnings were less than half than those of the same period in 1950. Due to heavy tax increases, lower volume resulting from government controls, higher costs, frozen prices, etc., Chrysler earnings totaled only $50.1 million for the first nine months of this year, compared with $105.2 million for the same period a year ago. How seriously earnings have been hit is indicated by the fact that profit was only 2.52 per cent of sales, as compared with 7.06 per cent during the first three quarters of 1950. Prospects for the fourth quarter show little chance for improvement, since Chrysler's authorized allotment is only 278,000 units.

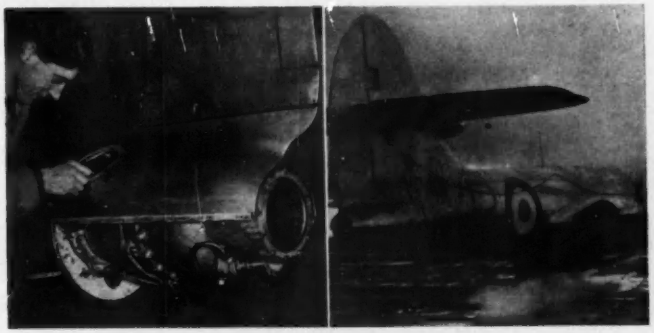
PRACTICAL UTILITY VEHICLE

The Deliveryman, a new commercial vehicle in the Rambler series, has recently been introduced by Nash Motors Div. of Nash-Kelvinator Corp. Containing about 52 cu ft of cargo space, the new model is powered by an 82-hp, six-cyl, L-head engine with a displacement of 172.6 cu in. The vehicle is 176 in. long, 61 in. high, and 73½ in. wide.

Packard Nine-Months Net Far Above 1950

Packard Motor Car Co. has reported earnings of more than $4.9 million for the first nine months of this year, a sharp contrast to the net loss of $1.45 million for the same period a year ago. An interesting fact is that the earnings total is after provision of $5.335 million for estimated income taxes, or $400,000 more than earnings.

(*Turn to page* 164, *please*)



POWERFUL ROCKET MOTOR

Shown above is an installation of the Armstrong-Siddeley "Snarler" bi-fuel rocket motor, which uses liquid oxygen and a water/menthol mixture (See AUTOMOTIVE INDUSTRIES, Oct. 15, p. 44). The unit weighs 215 lb, can be accommodated in a space measuring six ft by three ft, and gives 2000 lb thrust at sea level. It can be switched on and off at will to give the fighter pilot a sizeable advantage, particularly at high altitudes

Trial by Torture

LIFE is too short to determine the useful life of our ball bearings under normal conditions. That is why we *accelerate* tests, by overspeed, overload, extremes of temperature, by running, under every conceivable condition of operation, day and night, year after year.

Around the clock, our engineers continue the research that has made the best bearings of yesterday even *better* bearings today.

Forty years of this searching have given us a wealth of experience that should be helpful to you. No need for trial and error. We've been all through that, for your benefit.

Nothing Rolls Like a Ball...

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BALL BEARINGS

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149

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Studebaker Corp.—**P. O. Peterson** and **K. B. Elliott** have been named executive vice presidents. **E. C. Mendler** and **R. A. Hutchinson** have been appointed vice presidents.

Kaiser-Frazer Corp.—**T. A. Bedford** has been named vice president in charge of manufacturing.

Caterpillar Tractor Co.—**Harry H. Fair** has been elected chairman of the board of directors.

Avro Canada, Ltd.—**Crawford Gordon, Jr.**, has been appointed president and general manager. **Roy Dobson** has become chairman of the board of directors.

Champion Spark Plug Co.—**O. C. Leighty** has been named sales manager to succeed **C. L. Corwin**, who has been appointed advisory sales manager. **Dr. James F. Owens** has joined the company's Ceramic Div.

Hudson Motor Car Co.—**W. M. Williams** has been selected for the post of purchasing agent.

Dodge Manufacturing Corp. — **John A. Rozos** has been named director of exports.

Chrysler Corp., Export Div.—**George V. Candler, Jr.**, has been appointed merchandising manager.

Ford Motor Co., Ford Div.—**Donald C. Burdette** has been appointed manager of the parts and accessories sales department.

Curtiss-Wright Corp. — **Eugene M. Lokey** and **James G. Byron** have been elected vice presidents.

Willard Storage Battery Co.—**Paul G. Gleason** has been promoted to manager of plant engineering.

L & J Press Corp.—**W. Burl Saul** has been named vice president in charge of production and engineering.

Twin Disc Clutch Co.—**G. L. Shuman** has been elected vice president-finance and secretary. **R. G. DeLong** has been selected as vice president, Hydraulic Div. **W. F. Shurts** has been appointed director of engineering.

Pacific Airmotive Corp.—**B. H. Atwater** has been appointed vice president, sales and contracts. **J. B. Waskey** has been upped to the post of assistant to the vice president of production. **L. B. Littrell** has been named manager, Engine Div.

Dow Furnace Co.— Daniel L. Wertz has been appointed vice president in charge of sales.

Magnecord, Inc. — C. G. Barker has been named president of two new corporations, Magnecord Western Hemisphere Corp. and Magnecord International, Ltd.

Norton Co., Abrasive Div.—**Lorenzo S. Washburn** has become quality manager, succeeding **Charles J. Hudson**, retired.

Vonnegut Moulder Corp.—**Oliver S. DeHaven** has been reappointed chief engineer.

Baker-Rauling Co.—**Edwin W. Sankey** has been elected vice president and assistant to the president. **John A. Matousek** has been named vice president in charge of manufacturing.

Standard Machine and Tool Co., Ltd. —**S. A. Oliver** has been promoted to manager of engineering and sales, and **R. J. Barrett** has been named factory manager.

Clover Manufacturing Co.—**Theodore R. Treadwell** has been appointed sales manager.

Consolidated Vultee Aircraft Corp.— **R. J. Dillon** has been appointed manager of a newly formed expediting department. **Frank W. Davis** has been named assistant chief engineer of the San Diego Div.

General Motors Corp., Buick Motor Div.—**Jesse L. Powers** has been named assistant general manufacturing manager. He succeeds **Walter L. Larke**, who died recently. **Donald F. Taylor** has been appointed general superintendent in charge of all ordnance production.

Clarke Sanding Machine Co.—**Hal Croskey** has been named sales manager.

American Electro Metal Corp. — **George Stern** and **Richard P. Selig** have been elected vice presidents.

Kaiser-Frazer Corp.—**Steve A. Girard** has been appointed to the newly-created post of vice-president in charge of operations. He formerly was assistant general manager. **Clarke A. Silcott** has been named general manager and **K. J. Flood** manufacturing manager of the Engine Div.

General Motors Corp., Buick Motor Div.—**John A. Hoholik** has been named superintendent of the axle plant.

Round Chain & Mfg. Co.—**John F. Ansink** has been elected vice-president.

Willys-Overland Motors, Inc.—**Stuart E. Brennan** has been appointed national business management manager.

Chrysler Corp.—**Leroy A. Van Bomel** has been elected to the board of directors.

(*Turn to page* 170, *please*)

Necrology

Frank G. Webb, 83, founder of the American Automobile Association, died Oct. 22 in San Diego, Calif.

Walter N. Larke, 62, assistant general manufacturing manager, Buick Motor Div., General Motors Corp., died Oct. 24 in Flint, Mich.

Philip G. Mumford, 77, former president and chairman of the board of American Machine and Metals, Inc., and a director and former president of Commercial Solvents Corp., died Oct. 29 in Cedarhurst, L. I., N. Y.

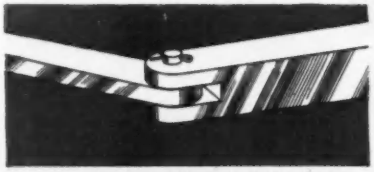
Thomas H. White, 57, former vice president and general manager of the White Motor Co., was killed in a plane crash Oct. 26, near Washington, D. C.

George M. Bicknell, 64, chief engineer, Carter Carburetor Corp. died October 11, in Daytona Beach, Fla.

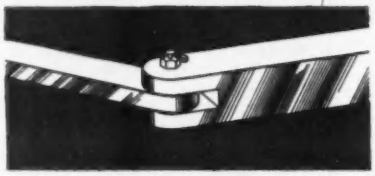
Roy W. Gifford, 68, former chairman of the board of the Borg-Warner International Corp., died Nov. 1, in Hendersonville, N. C.

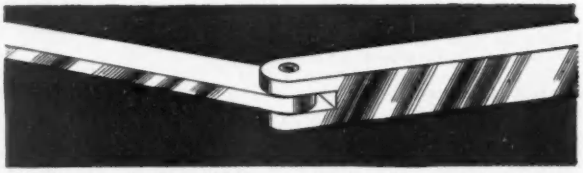
How to replace hinge pins and cotter pins with ROLLPIN self-locking fasteners

Rollpin replaces hinge pin for faster assembly of hinges. Inexpensively and simply driven in place, it cuts assembly costs. Constant spring tension holds Rollpin firm against vibration on heavy-duty automobile door hinges—on lightweight sheet metal hinges for meter or instrument panel covers.



IF YOU DO THIS ▲ *OR THIS* ▼ . . .





TRY THE ROLLPIN WAY INSTEAD . . . Rollpins offer many advantages as pivot and clevis pins for linkages or yoke assemblies. Heat-treated to provide excellent fatigue resistance and wear characteristics, Rollpins fit flush, grip firmly in the outer or inner members, depending on your design requirements, and are simply, inexpensively pressed in place. They are faster to install than cotter pins or safety wire . . . straight edges protect workers' fingers and clothing. Rollpins are readily removed with a punch . . . can be used again and again . . . assure simplified maintenance.

USE ROLLPINS **(1) To replace set screws and rivets. (2) To pin or key gears . . . pulleys . . . levers . . . knobs. (3) As locating dowels, stop pins or shafts for small gear trains.**

Once you test their effectiveness you'll want the secure, vibration-proof fastening of Rollpins in your products. Write now for a sample package and full details. Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J.

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GET YOUR FREE TRIAL ASSORTMENT OF ROLLPINS.

Mail this coupon now.

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Please send me full application data and test samples of the Rollpin.

Name_____ Title_____

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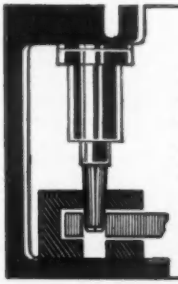


HERE'S HOW ROLLPINS PROVIDE A VIBRATION-PROOF FIT

Rollpins are easily pressed into production drilled holes—chamfered ends facilitate automatic or manual insertion.

Rollpins compress as they are driven—are self-retaining in production drilled holes—fit flush. Secondary hole-reaming or riveting operations are eliminated.

Constant spring tension against walls of hole lock Rollpins permanently in place until deliberately removed with a pin punch. Rollpins don't damage the hole and can be used again and again.

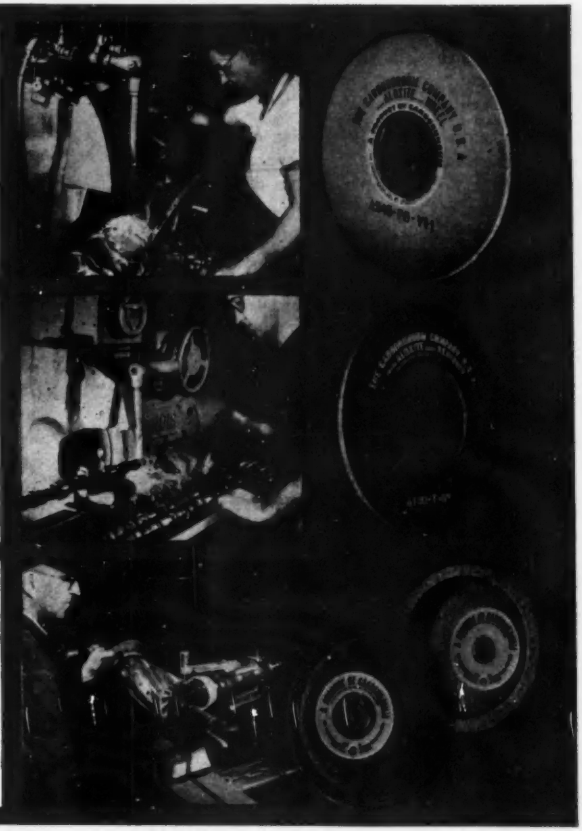
Grind RIGHT with the RIGHT wheel

When you select from the complete line of grinding wheels by CARBORUNDUM, you can be sure of getting the proper wheel backed by an adequate performance record. That's why it's always a good rule for better grinding to buy Abrasives by CARBORUNDUM.

● **They'll grind more crankshafts per wheel.** V11 bond wheels by CARBORUNDUM remove stock at an exceptionally high rate, yet heat generation and wheel wear are low. Look for better finish, size and form due to reduced grinding pressures.

● **They'll hit the close tolerance requirements of camshaft grinding.** BY resinoid bond wheels by CARBORUNDUM will maintain a uniform high cutting rate while giving improved finish.

● **They'll give you fast, accurate, repetitive grinds.** V20 bond wheels by CARBORUNDUM are at their best in the tool room. A sharp cutting action combines with excellent form holding qualities to impart a uniform fine finish that helps extend tool life between grinds. A versatile wheel, fewer grades for a greater variety of jobs—lower inventory required.



See your **CARBORUNDUM** distributor...or write Dept. AI 81-34.

Only CARBORUNDUM

TRADE MARK

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makes ALL Abrasive Products ...to give you the proper ONE

81-34

(Advertisement)

Here's what metal working management will want to know about Microcarb Control

NOTHING else can do what Microcarb does in controlling the carburization of steel parts. Gears, shafts, cams, bearings and all the other items which owe some of their high quality and low cost to the carburizing process can now be made even better—and possibly at even lower cost.

The cause of such improvement is simply that Microcarb measures directly the carburizing "strength" of the furnace gases which supply carbon to the work being processed.

Heretofore many carburizing equipments have measured the amount of carbonaceous material fed into the furnace, but none has **directly** measured the active carbon in the hot furnace gas. For a comparison, think of heating your home by putting fuel in the furnace, without a thermometer to tell the temperature. Keeping your home at the same temperature day in and day out would then be an art rather than a science; some one person's judgment would have to be accepted, but there'd be no check. The comparable condition has heretofore been quite common in carburizing operations, everywhere.

Microcarb ends that uncertainty; it measures and controls carbon directly. Heat-treaters simply set the Microcarb Controller at 90 if they wish to carburize to ninety carbon. "The carbon you set is the carbon you get".

The "reason why" for Microcarb is its carbon detecting element. This invention, called a Carbohm, is an engineering rarity—a truly new device for sensing a change in its surroundings.

Basically, a Carbohm is a wire, made of an alloy which will either absorb carbon from the furnace atmosphere, or lose it to the atmosphere, until it and the atmosphere are in equilibrium, carbon-wise.

With every change in the wire's carbon content, there's a corresponding change in its electrical resistance. The two Microcarb instruments — Controller and Carbon Recorder—translate this resistance directly into terms of percent carbon, control on that basis and record the result.

Only Homocarb carburizing equipment of our new Series H can be used with Microcarb, because the furnace and its temperature control must be designed to meet the needs of atmosphere regulation. Specific features are a soundly designed electric furnace with solid-bottom retort, improved fan housing and work support, and aerodynamically designed discharge jets. Micromax temperature control of the Duration-Adjusting Type is included.

Microcarb is many things to many men, especially in defense work.

To top management, Microcarb means better competitive position (for the individual company) quality-wise and possibly cost-wise. Also, it meets the usual desire for process control which is fully automatic.

To production executives, Microcarb means closer following of production schedules, because carburizing speeds and results are definitely more predictable than ever before.

To personnel executives, Microcarb means cleaner, more attractive working conditions. And, if the heat-treat uses incentive pay, Microcarb helps heat-treaters increase their earnings, because it makes it easier for them to apply their skill and therefore increase their productivity.

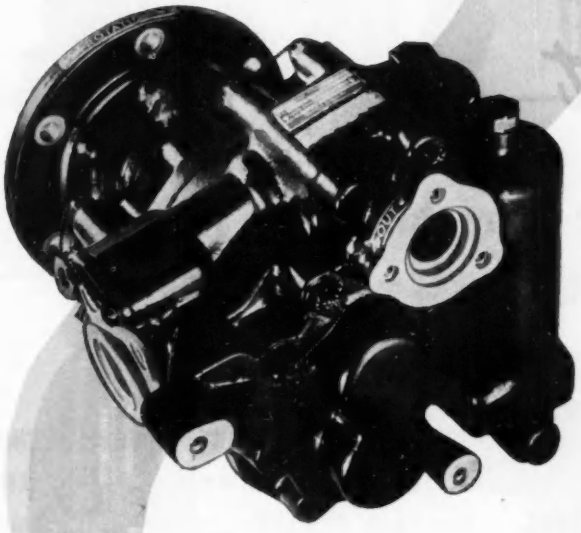
To metallurgists, Microcarb means some or all of the above advantages, plus a tightening of technique such as every technician likes. "New" or hard-to-handle steels hold fewer puzzles. Standard steels emerge with closer specifications. The heat-treat takes another long step toward becoming a manufacturing laboratory.

Let us send you further facts about this new Microcarb Control. Ask our nearest office, or 4966 Stenton Ave., Phila. 44, Pa.

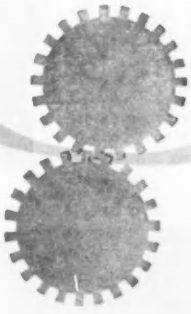
LEEDS NORTHRUP

Jrl. Ad. TD4-623(4)

Geared for peak performance at higher pressures . . .



THOMPSON GEAR PUMPS



Pressures up to 800 psi. are handled dependably, positively, by the new Thompson Gear Pump. This pump is designed and built to handle today's jet-fuel pressures efficiently with negligible wear. As a plus, it's ready to handle tomorrow's higher pressures with the same high efficiency.

You're assured of the most efficient design and finest workmanship when you specify a Thompson Gear Pump. It's backed by years of experience in building fuel pumps and other accessories for aircraft . . . it's backed by Thompson pioneering and engineering, by Thompson metallurgical experience . . . and by the thousands of Thompson pumps in the air around the world.

Let us tell you more about the new Thompson Gear Pump and other accessories.

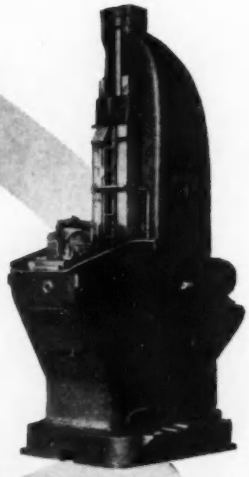
ACCESSORIES DIVISION

Thompson Products, Inc.

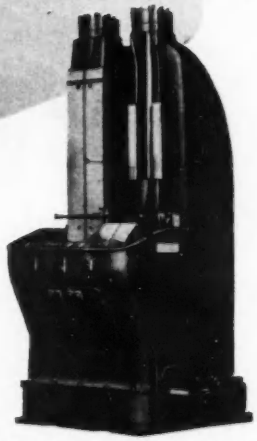
EUCLID, OHIO

YOU CAN COUNT ON THOMPSON FOR ENGINEERING LEADERSHIP

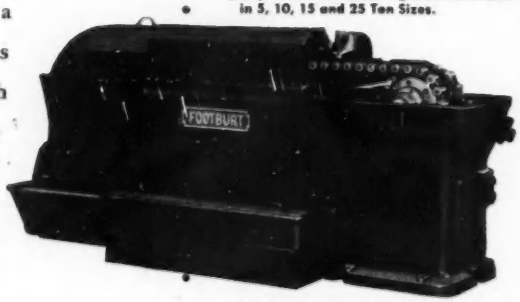
Latest surface broaching methods on cast iron parts teeth serrations and slots



●Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



●Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



●Continuous Type Broaching Machine. Made in 4 Sizes.

● Whether the material is steel or cast iron, parts are being successfully surface broached on Footburt machines. Broaches used on Footburt Surface Broaching Machines have a patented tooth that is especially advantageous on heavy cuts. We will be glad to work with you on your machining problems and make recommendations based on our many years experience in surface broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
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FOOTBURT surface broaching

FOR DIFFICULT MACHINING WORK

...a time tested line of machine tools

SEALED TO ORDER BY VICTOR

INTERNATIONAL'S SILVER DIAMOND 220 ENGINE FEATURES VIC-2-FOLD SEALING

It's plain to see why VIC-2-FOLD Sealing was specified for this International truck Silver Diamond valve-in-head engine with 6.5 compression ratio. It's the thinnest practical metal-asbestos head gasket construction having adequate compressibility for positive, durable sealing. On the engine, VIC-2-FOLD compresses to 3/64", at the same time provides maximum resistance to breakdown and corrosion, as illustrated at right. VIC-2-FOLD is the modern head gasket for the modern engine, say International engineers.

Sealed By Victor Assures Satisfaction

VIC-2-FOLD is but one of Victor's continuing achievements in better automotive sealing since 1909. For all such applications, Victor offers the pioneer's skill plus the most advanced facilities for developing, testing, and manufacturing gaskets and oil seals. Sealed by Victor means sealed to your exact specifications—and complete satisfaction.

VIC-2-FOLD

. . . THE THIN COMPRESSIBLE METAL-ASBESTOS HEAD GASKET FOR HIGH COMPRESSION ENGINES

Compressible to 3/64" average on engine, VIC-2-FOLD is the thinnest practical metal-encased asbestos gasket construction, utilizing the high strength of steel and the corrosion-resistance of copper. Note how steel bottom layer is formed up in combustion chamber openings, overlapping copper top layer for maximum protection against breakdowns and blowouts. Inversely, in coolant openings, copper layer is formed down to overlap steel layer, for maximum corrosion-resistance in contact with coolants and anti-freeze solutions.

More flexible than standard gasket construction, VIC-2-FOLD sealing is equally suited and fully effective on Valve-in-head or L-head engines.

Where can we help you get better sealing?

Victor Manufacturing & Gasket Co., *and its affiliate,* Victor Sealing Products Co., Inc., P. O. Box 1333, Chicago 90, Ill.

VICTOR GASKETS AND OIL SEALS

VICTOR

"ORIGINAL EQUIPMENT"

Gaskets and Oil Seals

SEALING PRODUCTS EXCLUSIVELY

Pegaso is the name given to this sports car which is the first postwar Spanish passenger car to go into production. The car comes into the same category as the Italian Ferrari and Alfa Romeo or the English Jaguar.

Mechanical of New

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

BARCELONA, SPAIN

SPAIN'S first postwar passenger car, produced by the nationalized E.N.A. SA. is a sports model, embodying much of what is usually considered to be racing practice. Known as the Pegaso, it comes into the same class as the Italian Ferrari and Alfa Romeo or the English Jaguar.

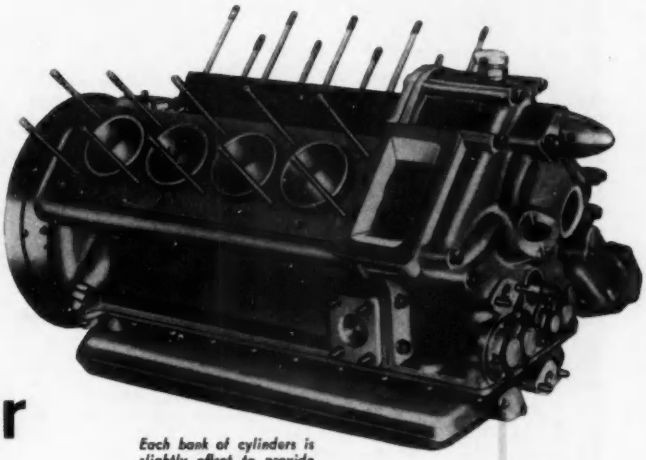
Main features of the Pegaso are a light-alloy V-8 engine of 151 cu in. with overhead camshafts, a five-speed transmission combined with the final drive; De Dion type rear axle; torsion bar suspension front and rear; and integral body-frame construction. Weight of the two or three seater sports sedan is 2135 lb and speed ability is claimed to be better than 125 mph. Three compression ratios are offered—7.9 to one, 8.5 to one and 13 to one.

The eight cylinders and the crankcase are a one-piece light alloy casting; the two banks are slightly offset to provide for side-by-side connecting rods. Removable nitrided cylinder liners are used, with two rubber seals at the base of each liner. Cylinder bore is 2.95 in. and piston stroke is 2.75 in. The crankshaft, with a main journal diameter of 2.51 in. and a crankpin diameter of 1.73 in., is nitrided and carried in five main bearings with forged aluminum caps. Connecting rods are machined all over, have two bolts, and are fitted on the crankshaft with a special aluminum alloy bushing which floats in both the rod and on the shaft. Piston pins consist of bronze bushings. Various types of pistons are used, according to the compression ratio adopted, those for the 7.9 and 8.5 to one ratios are aluminum alloy castings and those for the 13 to one ratio being aluminum forgings.

Cylinder heads are light alloy with valve seat inserts. Bronze-aluminum is used for the intake valves and high-speed tool steel for the exhaust valves. The valves—two per cylinder—are inclined in the head. Each has a lift of 0.33 in. Intake and exhaust valves are not interchangeable, the intake being tulip type (hollow head) with a face diameter of 1.81 in., while the exhaust has a 1.49 in. face diameter, with a flat face, a sodium filled stem and a deflector to direct the gases away from the bronze guide. The four overhead camshafts, an intake and exhaust camshaft in each head, are carried in needle bearings. Valve operation is through light - weight chill-cast piston-type direct - action tappets of 1.77 in. diam operating in bronze guides. These tappets, in which two coil springs are inserted, are made with helical slots to reduce weight and assist lubrication. Valve clearance is by means of steel disks between the end of the valve stem and the inner face of the tappet.

The camshaft drive normally comprises three roller

Features Spain's Pegaso Car



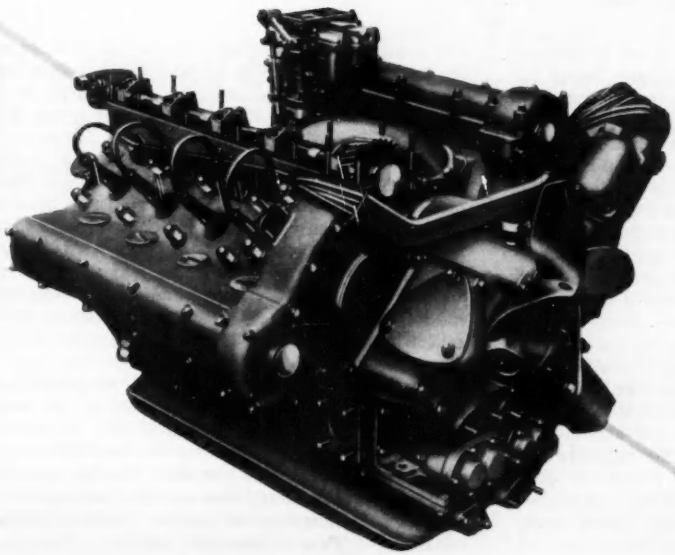
Each bank of cylinders is slightly offset to provide for side-by-side connecting rods. The removable nitrided cylinder liners have a bore of 2.95 in. A one-piece light-alloy casting is used for the cylinder block and the crankcase.

chains, in order to reduce length, but on the racing model chains are replaced by gears. The water pump is encased in the camshaft drive housing, and the four-blade light-alloy fan is positively driven through a flexible coupling. One vee belt is used for driving the generator off the rear end of the right-hand intake camshaft.

A scavenger and a feed pump are used for lubrication purposes. Oil pressure is 71 psi to the main bearings and 14 psi for the overhead valve gear. Capacity of the lubricating system is 2.7 gal. The scavenger pump delivers the oil to an oil cooler, which forms the base of and is a unit with the cooling system radiator. Since the radiator is fitted with thermostatically controlled shutters, the oil is warmed up at the same time as the water is warmed up.

There is some variation in the ignition system according to the car model, either one Bosch distributor is used, one used for each bank of cylinders, or, in case of the racing model, a magneto being substituted for battery ignition.

Normally a Weber dual carburetor, 36 D.F. 1, is used and is mounted between the two banks of cylinders, but four dual carburetors can be applied. The fuel pump used is

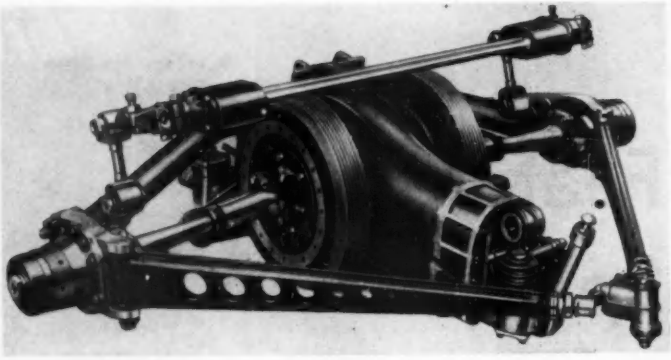


The V-8 151 cu in. engine has overhead valves and dual overhead camshafts for each cylinder head. Illustrated is the engine used for racing purposes since the camshaft is gear driven — conventional models use a chain camshaft drive.

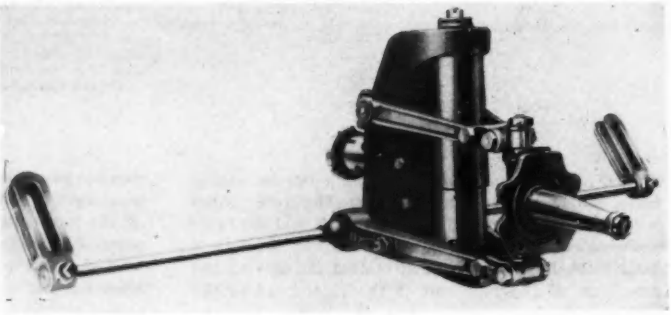
driven off the rear end of the right-hand intake camshaft. Air for the carburetor is admitted along the top edge of the radiator grille, and is led through ducts, which are attached to the inner face of the hood, to an outlet which contacts a flange on the carburetor. The air filter is located inside these ducts and, while the hood is closed, there is an airtight seal between the filter and the carburetor flange.

No figures have been issued on power output, but maximum torque is claimed to be 137.9 lb ft at 3900 rpm. Dry weight of the engine is 398 lb without the clutch, this latter weighing 35 lb. The engine is said to operate on Spanish 72 octane gasoline, without any signs of knocking, with a compression ratio of 7.9. When 80 octane fuel is available, the 8.5 compression ratio may be used.

A single plate clutch with a diameter of 9.2 in. is used, and is mounted in an aluminum-alloy extension housing with a bearing at the rear end, thus reducing the length of the Layrub open driveshaft.



This rear assembly contains the transmission and final drive as an integral unit, the brakes — mounted next to the transmission and final drive housing, and the torsion bar suspension system.



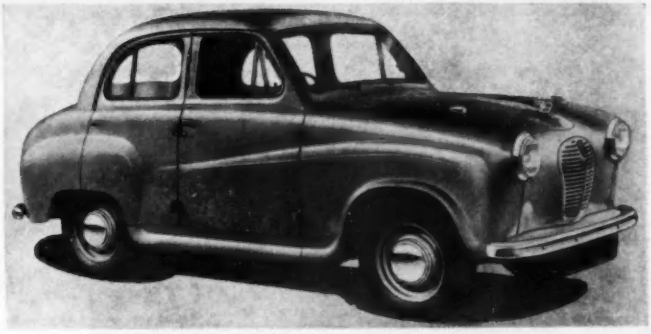
Front suspension consists of a pressed steel bracket, an upper and lower support arm, two torsion bars, and a hydraulic shock absorber.

The transmission and final drive form an integral unit at the rear. While variations of this layout are to be found on different European racing cars, the system does not appear to have been applied before to any standard car. The five forward speeds are all indirect, a De Dion type axle is used, brakes are mounted next to the transmission and final drive housing, radius arms are at the rear of the unit, and suspension is by transverse torsion bars. The differential and transmission housing is a three-piece casting; the main portion of which carries the spiral bevel gear, differential and the transmission gears. To the rear of this unit an extension is bolted which carries the reverse and the first gear. A cover attachment contains the oil pump and filter and has a rubber bushed eye for attachment of the unit to the chassis. There are two other eyes for attachment at the forward end of the transmission housing. The De Dion type tubular axle is made of chrome-molybdenum steel and the supports and shafts are chrome-nickel. All vital points are lubricated under pressure. Attachment of the unit's three-point mounting is not direct to the body-frame assembly, but through rubber-bushed linkages to give an additional degree of flexibility. A vertical channel on the forward face of the transmission housing contains a heavy rubber block mounted in a ball bearing on a tubular control arm. Lateral displacement of the unit is thus prevented, while leaving free the vertical rise and fall. Another unusual feature is that the radius triangle is carried to the rear instead of forward. Rear brake drums are Al-Fin construction, with a diameter of 12.6 in., and have vanes to draw in a current of air through louvres on the side of the body. Air is evacuated in a low pressure zone at the rear of the body. Two torsion bars are mounted transversely; the adjustable levers splined on the ends of these bars have rubber-bushed linkage to lugs on the tubular control arm.

For the independent front wheel suspension, a pressed steel bracket, trunnion mounted to the body-frame assembly, is used. This bracket holds upper and lower support arms and provides an abutment for the head of a hydraulic shock absorber. The two arms of each support arm assembly are separate forgings, completely machined and united by bolts. Connected to the

(*Turn to page* 124, *please*)

New Austin Model *Presented at* British Automobile Show



New Austin Seven which features integral body and frame construction.

By W. F. Bradley
Special European Correspondent for AUTOMOTIVE INDUSTRIES

LONDON, ENGLAND

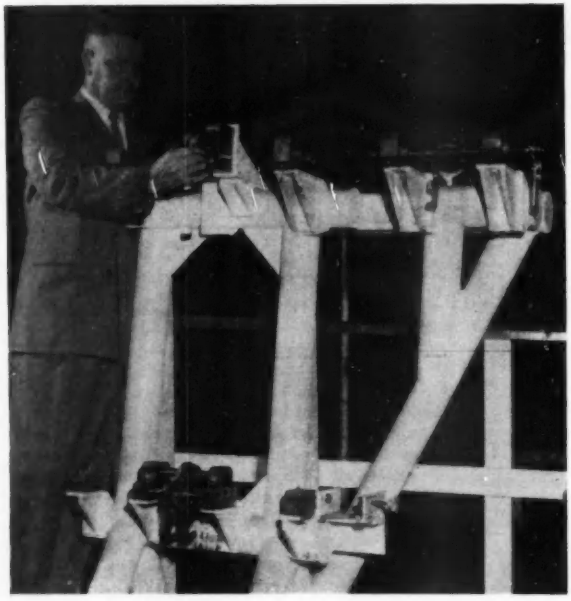
EARLS Court, London, housed more than 400 automobiles representing 64 makes from six different countries, at the Thirty-Sixth British Automobile Show. Britain had 32 automobile manufacturers, the U.S.A. and Canada had 17 makers, 10 came from France, four from Italy and one from Germany. Including a very comprehensive accessory, equipment and servicing section, together with trailers and a marine exhibit, 520 different firms were united.

Undoubtedly the outstanding novelty was the uncovering by Austin of a new "Seven" four-cylinder four-passenger model, selling at £325 on the home market (exclusive of purchase tax) and undercutting all makes with the exception of the Ford Anglia. The lowest priced line by Morris is £333; Vauxhall's four-cylinder model is listed at £475, and Renault's lowest price is £430. This Austin just suits British requirements and is a modernized revival of a type which was very popular in England twenty years ago. Production is announced for the early months of 1952, but quantities

(*Turn to page 94, please*)

The first Convair-Liner 340 wing is shown being assembled here in the largest wing fixture ever built by Convair. The steel wing fixture is 108-ft long and weighs 50,000 lb.

Unit Assembly of Wings With 50,000-Lb Fixture



A machining unit for use with the wing fixture is used for boring, reaming, spotfacing, and back spotfacing of landing gear fittings and drag link fittings on the wing.

CONVAIR'S decision to build wings for the 44-passenger Convair-Liner 340 in one section required construction of a large vertical fixture. Largest wing fixture ever designed by Convair for building wings in single sections, the steel structure is 108 ft long, 12 ft high, and 13 ft wide. It weighs approximately 50,000 lb.

The wing buck consists of a center steel box to which is attached a 20 in. diam pipe running outboard to station eight. Beyond this point, the construction consists of three eight-in. diam pipes welded together by plates forming a triangle. Overhead trusses which support the front spar are constructed of pipe and are held at stations one, nine, and 19, and the outboard extremity of the fixture. These trusses are located on their

Approximate Quantity of Steel Pipe Used in 340 Fixture

Pipe Size (in.)	Length (ft)
1	220
1½	125
2	375
3	15
4	50
6	50
8	565
12	30
20	65

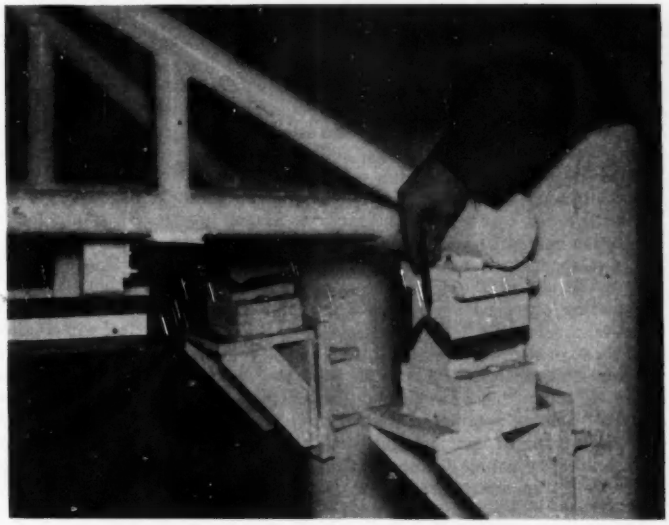
This view of the fixture shows the truss braces which control dihedral of the wing.

supports by vee blocks which are positioned to allow for the difference in expansion of the base mass of the fixture and the truss.

A 340 wing consists primarily of front and rear spars, bulkheads, and skin-stringer panels. A structural splice is located outboard of station eight due to the difference in dihedral. Front and rear spars are located by rails running the full length, both upper and lower surfaces, in order to insure proper relationship between the front and rear spar. Rails which locate the front spar have bushings which are used to drill the spar rail after the wing is assembled to assure interchangeability of the leading edge.

Major locating provisions provided in the buck are: (1) Wing to fuselage attach points. (2) Landing gear and drag link fittings. (3) Wing tip attach fittings. (4) Front and rear spar.

Vee blocks are shown here for location of truss at wing tip. Note vee block is placed for jig expansion.



Wing bulkheads do not require location in the fixture because bulkhead attach angles are located on the spars in the spar table prior to assembly.

Upon completion of the wing assembles, the landing gear and drag link fittings are machined in the fixture by a removable machine tool. This tool is located from a master machining plate installed between stations five and nine. The plate is attached to main lower structure of the buck. Boring, reaming, spot-facing, and back spot-facing are completed by the machine tool.

Largest Metal Show and

First World Metallurgical Congress and 33rd National Metal Congress and Exposition Featured the Role of Metals for Defense in the Free World. Much Interest Displayed in New Developments for Defense Production.

CLAIMED to be the largest and most successful ever held, the 33rd National Metal Congress and Exposition held simultaneously with the First World Metallurgical Congress last month in Detroit had 400 exhibits and a registered attendance of approximately 45,000. Most of the exhibits dealt with the saving of critical materials and achieving faster production for defense. Technical meetings held by the World Metallurgical Congress, American Society for Metals, American Welding Society, Institute of Metals Div. of the American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive testing were directed along similar lines.

Many new developments not announced prior to the exposition were made known publicly during the course of the affair. Carboloy Dept., General Electric Co. announced, just before officially opening its exhibit, five new products. The one product on which the most emphasis was placed is a chrome carbide, known as a series 600 carbide. This carbide, produced from powered metals, contains approximately 70 per cent by weight of chromium. Its outstanding properties, according to Carboloy engineers, include high resistance to abrasion, erosion and corrosion; lighter weight; a coefficient of thermal expansion approximately the same as that of steels; and extreme resistance to oxidation even at high temperatures. It is completely non-magnetic. At present it is in the pilot plant stage, but expansion is underway to assure full production as soon as possible.

The other products released by Carboloy are considered to be out of the laboratory stage and in the engineering appraisal stage. These include cemented carbides for bearing material, titanium carbide for possible high-temperature applications, metal-ceramic resistors—thermistors—for use in electrical instruments for controlling or measuring temperatures, and cemented carbide welding rods which may make possible the coating of iron and steel with a skin of carbide metal. The unique feature of thermistors is that their resistance sharply decreases with increasing temperature.

Announcement of a new type of rubber-impregnated leather packing was made by E. F. Houghton & Co. Known as 1243 VIM leather packing, it is said to combine the friction and strength characteristics of leather with the sealing, resilience and heat resistancy qualities of rubber. The polymerization process of bonding and impregnating the leather with the synthetic elastomer was not disclosed by the company. Currently only two styles are available—vee and cup packings, and these are being produced in standard sizes.

Several surface treatments of unusual character were unveiled by the Freeman Chemical Co. One of these, said to be a chemical conversion of the steel surface into a film capable of resisting cold forming pressures, is offered as an aid to press shops for cold forming. The film is produced by immersion of the blank in a hot chemical solution. Another treatment, called Nitracoat, is a chemical surface conversion process for highly stressed parts that is claimed to be capable of resisting scoring, galling, and welding. This treatment is recommended for parts such as hypoid gear sets, exhaust valves, camshafts, drawing dies, piston rings, etc. For the present, production or experimental lots must be shipped to Freeman for treatment.

Magnaflux Corp. had on display a scanner for the automatic fluoroscopic inspection of metal parts. It is claimed that this scanner, which is not yet in production, will eliminate the human element in inspection. A paper, "Photoelectric Scanning of Magnetic Particle Indications," dealing with the new Magnaflux development, was presented by S. A. Wenk and Donald Cooley of the Battelle Memorial Institute before the Society for Non-Destructive Testing.

The F. J. Stokes Co. exhibited some plastic parts which resemble the chrome trim used on passenger cars. Developed by Rohm and Haas, these parts consist of molded Plexiglas with a special color formula metal—629 blue—film applied to their interior surfaces. Stokes was responsible for the process of evaporating the metal film and applying it to the plastic surface. After the part is coated with the blue metal film, a coat of lacquer is applied. Several automotive companies are claimed to have accepted the product pending the outcome of field tests being conducted by Rohm and Haas.

Congress in History

By Thomas MacNew

An industrial television setup shown by Radio Corp. of America received much interest from the visitors at the show. One of the first applications of industrial television in an automotive plant was described in the Dec. 15, 1950, issue of AUTOMOTIVE INDUSTRIES.

Another comparatively recent development in which a great deal of interest was displayed was the Croning process exhibited by Bakelite Co. This foundry method for making molds and cores was described in the April 15, 1950, and June 15, 1950, issues of AUTOMOTIVE INDUSTRIES. Since that time, however, the process has been taken up by several automotive manufacturing companies and it is being exploited for a sizable role in the defense effort.

Much attention was directed to the cold extrusion of steel—another production process which has become a factor in defense manufacturing. In addition to the Freeman Chemical Co. already mentioned, the Parker Rust Proof Co. and Heintz Mfg. Co. had displays devoted to difficult cold-forming applications. Parker manufactures Bonderite and Bonderlube which are lubricants for the cold forming process, while Heintz performs the mechanical techniques involved to make a finished part. Both companies displayed cold formed 105 mm artillery shells.

The official opening of the World Metallurgical Congress was keynoted by the address made by William C. Newberg, president, Dodge Div., Chrysler Corp., who acted as spokesman for Detroit industry. He emphasized that the success of the current industrial program may well rest on the metallurgists. Mr. Newberg said, "With the military situation as it is today, we must meet the challenge of an unusual emergency to support the planning of both our military and civilian leaders. Tanks, trucks, armor plate, ships and munitions require intimate knowledge of metals and ingenuity of the highest order in high quantity production. New problems involving shortages of strategic materials have come because of the enormous demands of this complicated economy."

In another opening day address, Dr. Clyde Williams, director, Battelle Memorial Institute, spoke on metals for defense in the non-ECA countries of the free world. He stated, "Through technology, the free enterprise system has risen to great heights wherever it has been permitted to exist." "It is our hope that similar success will reward the application of the free enterprise system to the problems of metal supply among the free nations of the world," he went on to say.

During the course of the exposition, the ASM, SNDT, and the AWS elected and installed new officers. The American Society for Metals elected John Chipman, Massachusetts Institute of Technology, as president; Ralph L. Wilson, Steel and Tube Div., Timken Roller Bearing Co., as vice-president; and Ralph L. Dowdell, University of Minnesota, as treasurer.

President elect of the Society for Non-Destructive Testing is Noah Kahn, U. S. Naval Shipyard, and the vice-president elect is Dr. Robert C. McMaster, Battelle Memorial Institute. Treasure of the society for 1952 is Dr. Gerald H. Tenney, Los Alamos Scientific Laboratory.

New officers installed by the American Welding Society include C. H. Jennings, Westinghouse Electric Corp., as president, and F. L. Plummer, Hammond Iron Works, as vice-president.

All of the technical meetings sponsored by the various societies were very well attended and there was much spirited discussion on some of the papers presented. Published herewith are extracts of three of the many excellent papers read at the Congress.

Aluminum-Six Per Cent Magnesium Wrought Alloys for Elevated-Temperature Service

By K. Grube, Battelle Memorial Institute, and L. W. Eastwood, Kaiser Aluminum and Chemical Corp.

THE aluminum-base wrought alloys, containing magnesium are not so strong at room temperature as the high strength, heat-treatable 24S and 75S alloys of aluminum, but they have advantages of low density, excellent resistance to corrosion, moderately high tensile properties at room temperature, and very high tensile properties at elevated temperatures up to 600 F.

In view of the good tensile properties of the six per cent magnesium binary alloy, its low density, and high resistance to corrosion in normal exposures, it was selected as a base for further development. This further development was carried out by making additions to this base, the purpose of which was mainly to improve the resistance to creep at 600 F. Accordingly, a considerable number of single additions were made to this binary base. The effects produced on the creep resistance are quite remarkable. However, because the creep resistance of

TABLE I

Tensile and Creep Properties of Some of the Best Complex Aluminum-Base Alloys Containing Magnesium
(Tested in the Form of 0.020-Inch Sheet)

Heat No.	Intended Composition Bal. Aluminum		Heat* Treatment	Test Temp. °F	Tensile Properties			Creep Properties					
	Mg, %	Others %			Elong. % in 2 Inches	Yield Strength 0.2% Offset psi	Tensile Strength psi	Stress psi	Duration Hours	Initial Deformation, %	Final Total Deformation, %	Minimum Creep Rate, %/Hr.	Total Deformation in 250 Hrs., %
A5980	6.0	0.50 Cr 0.10 Ti	HTS-1	Room	22.5	27,200	49,775						
			HTS-1	600	63.0		11,200	2,000	289.0	0.080	0.117	0.00034	0.111
			HTS-1	600				2,000	358.1	0.05	0.182	0.0002	0.110
A5980	6.0	0.50 Cr 0.10 Ti	HTAS-1	Room	24.0	27,425	49,050						
A5980	6.0	0.50 Cr 0.10 Ti	HTCR-1	Room	15.5	40,425	52,450						
				600	60.5		9,100						
A5980	6.0	0.50 Cr 0.10 Ti	HTSCR-1	Room	15.7	39,900	52,400						
				600	60.5		9,900						
A6023	6.0	0.50 Cr 0.25 Ti	HTS-1	Room	21.2	22,950	43,450						
			HTS-1	600	64.0		9,375	2,000	336.8	0.040	5.54	1.17	4.72
A6023	6.0	0.50 Cr 0.25 Ti	HTCR-1	Room	10.5	39,850	47,900						
			HTCR-1	600	57.5		8,575						
A6120	6.0	0.50 Cr 0.05 Ti	HTS-1	Room	24.5	27,250	50,100						
			HTS-1	600	61.0		11,353	2,000	479.9	0.050		0.0001	
			HTS-1	600				2,000	339.5	0.050(3)	0.106(3)	0.00005(4)	0.100
A6120	6.0	0.50 Cr 0.05 Ti	HTCR-1	Room	14.5	42,750	53,550						
			HTCR-1	600	59.5		10,625						
A6120	6.0	0.50 Cr 0.05 Ti	HTSCP-1	Room	14.0(1)	41,900(1)	53,200(1)						
			HTSCR-1	600	66.0		10,625						
A6121	6.0	0.50 Ti 0.10 Ti	HTS-1	Room	22.2	26,160	47,900						
			HTS-1	600	54.5		11,375	2,000	292.0	0.050	0.986	0.0007(5)	0.836
A6122	6.0	0.50 Cr 0.15 Ti	HTS-1	Room	22.2	25,650	47,600						
			HTS-1	600	55.5		11,525	2,000	307.6	0.05	0.213	0.00023	0.182

the ternary alloys is inferior to that of some of the complex alloys, creep data on them are not included. As noted previously, when the binary alloy at 600 F is subjected to a 2000-psi load, the rate of creep is too rapid to measure successfully. When chromium is added, very substantial reductions in creep rate were obtained. Fair resistance to creep is also obtained by reducing the magnesium and adding approximately 4.5 per cent copper, approaching the 24S composition. However, one to three per cent copper in a five per cent magnesium base is without appreciable benefit. Manganese, vanadium, and possibly zirconium also appear to have some beneficial effect upon the creep resistance of the six per cent magnesium alloys. Of these additions, however, chromium appeared to be the most beneficial, and considerable effort was made to make further additions to the six per cent magnesium—0.5 per cent chromium base to improve its creep resistance.

The tensile properties and creep data on a considerable number of the best complex alloys, all of which contain six per cent magnesium, are listed in Table I. Of the additions to the aluminum—six per cent magnesium base, chromium and titanium appear to be the most beneficial. As a result of this work, the following alloy appeared to have an excellent combination of tensile properties and creep resistance at 600 F: six per cent magnesium, 0.5 per cent chromium, and 0.10 per cent titanium.

Although an alloy of this type without the chromium and titanium has a creep rate at 600 F at 2000-psi load which is too rapid to be measured, the alloy with these additions had a minimum creep rate of only 0.003 to 0.0004 per cent per hr.

The high temperature tensile properties of alloys cold-rolled five per cent are somewhat inferior to those of the same material not given such a cold-rolled treatment. Creep data on alloys cold-rolled five per cent were not obtained. In all probability, however, such a treatment would have an adverse effect upon the creep resistance because of the recrystallization which may occur during the course of the test.

Interrelation of Mechanical Properties of Ductile Cast Iron

By R. Wayne Kraft and Richard A. Flinn, American Brake Shoe Co.

STRESS - STRAIN curves in tension for irons with spherical and flake graphite are compared in Fig. 1. Strength is generally two to three times and the ductility over five times greater in the ductile irons. Modulus of elasticity of the ductile irons is 20 to 25 per cent higher. The general position of ductile iron is therefore much closer to cast steel.

Impact Data

No comparison of steel, ductile iron and cast iron would be complete without some consideration of impact data. However, rather than consider impact properties along with tensile and elongation data, a separate section is necessary because of the admittedly less precise correlation with structure. The use of impact data in design is less quantitative than tensile strength and the effect is largely influenced by type of specimen and test conditions; the following characteristics should be interpreted therefore as exhibiting trends.

Notched and unnotched ASTM Type Y specimens were used and the data of Table A obtained.

While the unnotched data do not distinguish between the pearlitic steel and the austenitic iron, the notched bar data indicate a better capacity for distributing stress in the latter material.

The data show further that the ductile iron specimens of the ferritic, pearlitic and austenitic types possess impact properties of a higher order of magnitude than pearlitic cast iron with flake graphite.

Hardenability

The maximum hardness obtained in ductile iron is lower than for comparable steels, but the depth of hardening is equal or greater, Fig. 2. Hardness of the matrix is probably the same as indicated by previous work but the over-all hardness impression is larger because of the graphite. This distinction is important in dealing with service applications where the hardness of the matrix may be more important than the over-all hardness.

Depth of hardening of two ductile irons of the same effective alloy content is compared with hardenability of a steel of the same matrix analysis. Since the factors for magnesium and phosphorus were unknown, they were omitted. The steel data are calculated for both coarse and fine grain and the the depth of hardening correlates quite well with the iron. To develop the effect of magnesium somewhat further, a specimen with 0.169 per cent magnesium was also surveyed and exhibits markedly greater hardenability than for a comparable steel calculated without magnesium. This preliminary experiment indicates that magnesium may possibly have an effect similar to boron additions in increasing hardenability.

While the preceding data indicate that the mechanical properties of ductile iron resemble steel more closely than cast iron, the casting properties still resemble cast iron. Fluidity or castability is an outstanding example.

It has been demonstrated that the fluidity of a given cast iron is determined by the degrees of superheat (above the liquidus temperature) at which it is poured. Since the liquidus temperature for a given cast iron is not changed markedly by magnesium treatment, the same fluidity would be expected as for a normal cast iron of the same analysis.

To test this reasoning, a heat of 3.25 per cent carbon, 1.85 per cent silicon iron was melted and two taps were made. The first tap was inoculated with 0.40 per cent silicon as 75 per cent FeSi, while the second was treated with 2 per cent of 70 per cent Cu—30 per cent Mg alloy and 0.40 per cent silicon. The final analyses were similar except for magnesium.

Two double spirals were poured from each ladle. All of the points, including the two magnesium-treated double spirals, fall within the general relationship previously developed. The fluidity of ductile iron is therefore the same as normal cast iron, at least in the usual composition chosen for these experiments.

This excellent castability along with relative freedom from hot tears often results in exceptional properties in intricate castings compared with steel.

TABLE A

Impact Data—Type Y ASTM Specimens

Material	BHN	1 inch "Y" Blocks Unnotched: Average Ft-Lbs	Unnotched: Max. Deviation* Ft-Lbs	Notched: Average Ft-Lbs	Notched: Max. Deviation* Ft-Lbs
Austenitic ductile iron without chromium	134	229+	...	15.0	1.5
SAE 1095 drill rod, spheroidized	229	229+	...	2.4	0.6
Ferritic ductile iron, 3.22% Si	174	70.9	10.5	4.1	0.4
Austenitic ductile iron with chromium	163	42.5	2.5	4.1	0.4
Pearlitic ductile iron	255	18.4	4.9	1.0	0
Acicular ductile iron, 600°F—15—F.C., H.T.	416	4.1	0.9	0.5	0
Acicular ductile iron, as-cast	351	3.5	1.0	0.5	0
Class 50 gray iron	212	2.0	0.3	1.0	0

* Max. deviation shows greatest deviation from average in the quadruplicate tests made. For example: Values for austenitic iron without chromium, notched, were 16.5, 14.0, 15.0, 14.5. Average is 15.0. Max. error is 16.5 — 15.0 or 1.5.

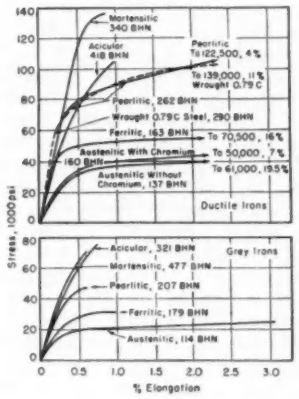


Fig. 1—Stress-strain curves of spherical and flake graphite irons. Specimens all taken from one-in. Y blocks.

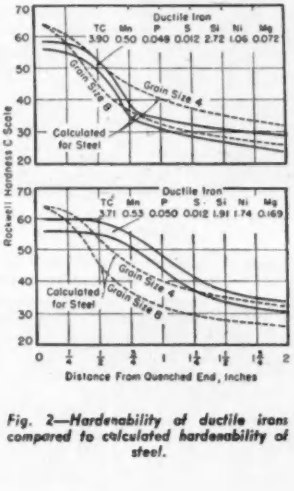

Ductile Iron
TC Mn P S Si Ni Mg
3.90 0.50 0.048 0.012 2.72 1.06 0.072
Grain Size 8
Grain Size 4
Calculated for Steel
Ductile Iron
TC Mn P S Si Ni Mg
3.71 0.53 0.050 0.012 1.91 1.74 0.169
Grain Size 4
Grain Size 8
Calculated for Steel
Rockwell Hardness C Scale
Distance From Quenched End, Inches

Fig. 2—Hardenability of ductile irons compared to calculated hardenability of steel.

Cladding of Molybdenum for Service in Air at Elevated Temperature

By W. L. Bruckart and R. I. Jaffee,
Battelle Memorial Institute

THE specific application of cladding for the protection of molybdenum has been studied by the authors. During this investigation, it was found that clad molybdenum is suitable as a material of construction for high temperature service in air. Thus, the useful service temperature range in air for stressed, clad molybdenum sheets can extend to 2000 F, a considerable improvement over bare molybdenum.

General Characteristics of Clad Molybdenum

When two metals are rolled together at high temperatures, a diffusion bond is formed. When molybdenum and

(*Turn to page* 84, *please*)

The Booming West Coast

Final assembly line at Douglas Aircraft Co. Shown here are six partly-completed C-124A Globemaster II transport planes.

This view, taken in Lockheed's Burbank, Calif., plant, shows F-94 all-weather jet interceptor planes at various stages of assembly.

WEST Coast aircraft manufacturers have a backlog of over $5 billion. Just as in World War II, they are producing about 50 per cent of the Nation's aircraft.

The heart of the Defense expansion problem today, as it was in World War II, is aircraft production, because all other Air Force programs must be geared to aircraft production.

The currently proposed National budget calls for Defense expenditures of around $56 billion, about $20 billion of which will go to the Air Force. The Air Force will spend more than $11 billion of its money on air equipment; the Navy over $4 billion; altogether a total of $15.25 billion on military procurement for air. Out of every Defense dollar earmarked for military procurement, 48¢ is going to the aircraft industry, and about half of that will be spent on the West Coast.

Actually, the aircraft industry is still in the first stages of the National Defense program, which is planned to reach its peak in 1953. It has made fine progress in acquiring additional facilities, developing higher scale manufacturing and subcontracting methods, and recruiting new employes. The current make-ready period is always a most trying and expensive phase. Although production rates are not in themselves large, they are several times the low rates prevailing immediately after World War II.

Defense Mobilizer Wilson recently reported that airplane output is now double that of a year ago and deliveries are to be quadrupled within the next two years. It is safe to estimate that the West Coast segment of the industry will produce about

Aircraft Industry

By
R. Raymond Kay

With Backlog of Orders over $5 Billion, Companies Now Have Tremendous Expansion Programs Underway to Hit Peak Production by 1953

2300 planes in 1951. As to future expansion, two factors control production: a shortage of machine tools and an intensifying shortage of critical materials.

The impact of the aircraft companies on the economic life of the West Coast is terrific. A survey made by this writer shows a total of 152,188 persons employed by the major aircraft companies. In southern California, 123,732 are employed, which makes this the largest manufacturing industry in the state. Taking the U. S. Bureau of Census estimate of 3.8 persons per average family, 386,581 persons representing nearly one-tenth of Los Angeles County's entire population, are directly dependent upon the aircraft wage dollar. Boeing, in Seattle, is the next largest employer, with 28,000 workers. Executives of the various companies anticipate that by year end employment will exceed 200,000. This compares with about 100,000 at work in West Coast plants at the start of Korean hostilities. Use of women workers is becoming more prevalent throughout the industry, but the time for Rosie the Riveter is not at hand.

The complexity of modern aircraft requires a vast increase in engineering personnel. Lockheed's president, Robert E. Gross, recently said, "In 1943, one out of 22 in our organization was an engineering employe. Today, the ratio is one to eight. That's how complicated and technical aircraft manufacture has become." Production of the fighter of World War II required 414 engineering hours. Today's jet fighter needs 3369 hours.

With the heavy production schedules facing the industry, it is constantly seeking competent subcontractors and suppliers. Eleven member companies of the Aircraft Industries Association in southern California now use over 23,000 subcontractors and suppliers. This number will be increased to 29,634 by the end of this year, company estimates disclose.

Airplanes Produced by West Coast Companies

BOEING	Seattle, Wash.	B-50 AF Superfortress B-52 AF heavy bomber C-97 AF cargo transport
	Wichita, Kan.	B-47 AF jet bomber
CONSOLIDATED VULTEE	San Diego, Calif.	R3Y-1 Navy cargo transoort seaplane (tooling up) T-29 AF navigator-bombardier trainer Convair Liner 340—commercial transport
	Fort Worth, Texas	B-36D & F, AF bomber, including reconnaissance models YB-60 AF prototype sweptback wing heavy bomber
DOUGLAS	Santa Monica, Calif.	DC-6 commercial transport R6D-1 Navy transport C-118A AF transport R4D-8 Navy transport
	Long Beach, Calif.	C-124A AF transport
	El Segundo, Calif.	F3D Navy fighter AD series Navy attack planes A2D Navy attack planes
HILLER HELICOPTERS	Palo Alto, Calif.	HTE Navy training helicopter H-23 Army evacuation helicopter
LOCKHEED	Burbank, Calif.	F-94C AF fighter F-94D AF fighter (tooling up) Constellation—commercial transport T-33 Navy and AF jet trainer TO-2 Navy and AF jet trainer P2V, P2V-5 Navy patrol bomber R70 Navy transport C-121 AF transport PO2-W Navy radar command plane
	Marietta, Ga.	B-47 jet bombers (tooling up)
NORTH AMERICAN	Los Angeles area	F-86D & F, AF fighter T-28 AF trainer AJ-1 Navy bomber RB45C Navy jet bomber F-86A AF fighter modification work T-6G AF trainer modification work
	Columbus, Ohio	T-6G AF trainer remanufacturing F-86F AF fighter (tooling up) AJ-1 Navy bomber (tooling up) FJ-2 Navy fighter (tooling up)
NORTHROP	Hawthorne, Calif.	F-89 AF fighter
RYAN	San Diego Calif.	XQ-2 jet AF pilotless target plane L-17B Army liaison plane

Payrolls

		1948	6 months ending June 30, 1951
BOEING	Seattle, Wash.	$ 53,489,000	$ 58,317,000
	Wichita, Kan.	14,822,000	45,625,000
CONSOLIDATED VULTEE	San Diego, Calif.	(not avail.)	45,000,000
	Fort Worth, Texas	(not avail.)	(not avail.)
DOUGLAS	Santa Monica	23,668,283	25,941,951
	El Segundo	20,453,142	19,648,281
	Long Beach	9,880,643	21,778,345
	Tulsa, Okla.	(inactive)	(not avail.)
HILLER HELICOPTERS	Palo Alto, Calif.	(organized '48)	750,000a
LOCKHEED	Burbank, Calif.	53,756,000	49,530,000
	Marietta, Ga.	(inactive)	2,400,000
NORTH AMERICAN	Los Angeles area	65,000,000	53,000,000
	Columbus, Ohio		(included above)
NORTHROP	Hawthorne, Calif.	18,000,000	22,000,000
RYAN	San Diego, Calif.	4,750,000	5,000,000
		$263,819,068	$348,990,577

a—estimated.

In 1950, 40.1 per cent of the sales dollar of the 11 firms went for subcontracts and material purchases. The remaining 59.9 per cent were for labor, plant amortization, taxes, utilities, rental, and profit. In 1951, an estimated 46.03 per cent will go to subcontractors and material purchases by the same companies, and the remaining 53.97 per cent for labor, taxes, etc. The industry anticipates that in 1952 it will show an even higher percentage of the sales dollar being channeled to subcontractors.

This article is devoted primarily to the major aircraft companies—the prime airframe contractors to the services. All the West Coast companies except Northrop Aircraft and Ryan Aeronautical Co. operate branch plants in various states in the nation. North American Aviation operates as far east as Columbus, Ohio (former Curtiss-Wright plant). Engineering and management stem from the main offices. It is necessary to include these branch plants for a complete picture of the size, the scope, and the economic impact of the West Coast companies.

Peak production for the entire industry during World War II was $9233 million. It plummeted to $114.2 million in 1948. (See AUTOMOTIVE INDUSTRIES, 33rd Annual Statistical Issue, March 15, 1951). The accompanying tables show where the expanded industry stands today compared with the 1948 low point.

Now let's take a look at the individual companies.

The Booming West Coast

Boeing

Boeing Airplane Co. has a total of 8,604,396 sq ft of plant area in use at its Seattle, Wash., and Wichita, Kans., Divisions. The Seattle area figure is 5,395,032 sq ft as compared with approximately 4,200,000 in 1948, while Wichita's present 3,209,364 sq ft (including the Government-owned, Boeing-operated Plant 2 there) compares with about 2,750,000 sq ft in 1948.

At the end of 1948, a total of 23,679 employes were working in the Seattle area and 6700 at Wichita. Employment figures were 27,991 and 21,123, respectively, at the end of the first six months of 1951. Women employes totaled 3582 in 1948, and 5544 at the end of June, 1951, in Seattle, while Wichita's payroll showed 832 women in 1948 and 3183 last June.

The Seattle payroll was $53.4 million for the year 1948, and $58.3 million for the first six months of 1951. Wichita's 1948 payroll was $14.8 million, and for the first half of 1951 it was $45.6 million.

Total sales, the major portion of which were military, totaled $126.9 million in 1948, and $168.2 million in the first half of 1951. The company had a backlog of

Assembling Hiller helicopters

approximately $445 million at the end of 1948. The midyear 1951 figure was $1 billion.

Boeing currently is producing four models of airplanes, all military. The B-47 Stratojet, which in 1949 set a transcontinental speed record of 607.8 mph, is in quantity production at Wichita. The B-50 Superfortress and C-97 Stratofreighter are being built at the Boeing-operated Government-owned plant in Renton, Wash., a few miles from the Seattle plant where production of the new B-52 multijet heavy bomber will be centered. The first of two experimental B-52's is expected to be rolled out before the end of the year.

Development of the Boeing gas turbine engine has been continued as a special project, financed partly from company funds and partly by contracts from the Navy. The company is investigating such practical applications as primary power plants for trucks, boats, and small airplanes, power for operating electric generators and pumps, and auxiliary power for industrial use.

Boeing is also building a number of electronic analogue computers capable of solving the lateral and longitudinal rigid body flight equations of an airplane and its control surface actuators simultaneously.

Sales and Unfilled Orders

	Sales		Backlog	
	1948 ($ thousands)	6 months ending June 30, 1951 ($ thousands)	1948 ($ thousands)	6 months ending June 30, 1951 ($ thousands)
BOEING	$126,931	$168,150	$ 445,000	$1,000,000
CONSOLIDATED VULTEE	112,000	145,000a	156,000	516,000
DOUGLAS	118,582	97,208	200,000b	1,000,000b
HILLER HELICOPTERS	(organized 1948)	(not avail.)	(organized 1948)	20,000
LOCKHEED	125,621	98,000	200,000	1,245,000
NORTH AMERICAN	94,782	74,000	380,000	510,000
NORTHROP	27,000	53,500	96,000	255,000
RYAN	8,000	8,500	12,000	40,000
	$612,916	$644,358	$1,489,000	$4,568,000

a—December 1950 to May 1951.

b—At press time, the backlog was announced as $1,335 million, as of August 31, 1951.

for the United States Army.

Consolidated Vultee

Highlights of Consolidated Vultee Aircraft Corporation's current operations may be summed up as follows:

(1) Opening of a Guided Missile Division at San Diego to mass produce guided missiles for the U. S. Navy Bureau of Ordnance;

(2) Construction at Pomona, Calif., of a $50 million Navy-Convair facility to which the Guided Missile Division will move upon completion;

(3) Tooling up at San Diego Division for contract production of Navy R3Y-1 turboprop cargo-transport seaplanes and new Convair-Liner 340 commercial transports, and continued T-29 navigator-bombardier trainer production for the Air Force;

(4) Initiating of production at the Fort Worth, Tex., Division of a proto-type sweptback-wing version of the Air Force's B-36 intercontinental bomber, to be designated the YB-60, and continued output of B-36D and B-36F versions of the long-range bomber, including reconnaissance models.

Sales for the six months ended May 31 were about $145 million compared with $76 million for the first six months of the previous year. Convair's unfilled orders, including those being negotiated and expected to mature, were estimated to bring the company's total backlog to more than $516 million.

West Coast Aircraft Industry *(continued)*

EMPLOYMENT

		1948		6 months ending June 30, 1951*	
		Total	Women	Total	Women
BOEING	Seattle, Wash.	23,679	3,562	27,991	5,544
	Wichita, Kan.	6,700	832	21,123	3,183
CONSOLIDATED VULTEE	San Diego, Calif.	9,927	(not avail.)	19,000	5,000
	Fort Worth, Texas	12,357	(not avail.)	30,100	4,600
DOUGLAS	Santa Monica, Calif.	5,691	984	13,841	3,196
	El Segundo, Calif.	5,852	1,063	10,179	1,701
	Long Beach, Calif.	2,699	455	12,301	2,259
	Tulsa, Oklahoma	(inactive)	(inactive)	1,610	(not avail.)
HILLER HELICOPTERS	Palo Alto, Calif.	50	(not avail.)	465a	92
LOCKHEED	Burbank, Calif.	15,905	2,386	29,719b	4,858
	Marietta, Ga.	(inactive)	(inactive)	3,910bl	(not avail.)
NORTH AMERICAN	Los Angeles area	21,344	2,749	23,192c	3,495
	Columbus, Ohio			6,500cl	(not avail.)
NORTHROP	Hawthorne, Calif.	5,100	(not avail.)	12,500	(not avail.)
RYAN	San Diego, Calif.	(not avail.)	(not avail.)	3,000d	700
	TOTALS:	109,534	12,051	215,431*	34,628*

a— 535 to be added by January 1, 1952.
b—1,881 to be added by January 1, 1952.
bl—4,500 to be added by January 1, 1952.
c—3,808 to be added by January 1, 1952.
cl—3,500 to be added by January 1, 1952.
d— 500 to be added by January 1, 1952.
*—6 months only.

PLANT AREA

		1948 (sq ft)	6 months ending June 30, 1951 (sq ft)
BOEING AIRPLANE CO.	Seattle, Wash.	4,200,000	5,385,032
	Wichita, Kan.	2,750,000	3,209,364
CONSOLIDATED VULTEE AIRCRAFT CORP.	San Diego, Calif.	2,000,519	3,274,432a
	Fort Worth, Texas	3,471,130	4,115,948b
DOUGLAS AIRCRAFT CO.	Santa Monica, Calif.	2,499,091	2,622,403f
	El Segundo, Calif.	1,643,913	1,732,586g
	Long Beach, Calif.	1,504,105	2,099,665h
	Tulsa, Oklahoma	(inactive)	2,041,401
HILLER HELICOPTERS, INC.	Palo Alto, Calif.	38,000	100,000
LOCKHEED AIRCRAFT CORP.	Burbank, Calif.	6,110,000	11,053,000
	Marietta, Ga.	(inactive)	5,000,000
NORTH AMERICAN AVIATION, INC.	Los Angeles area	3,881,954	4,719,500d
	Columbus, Ohio		2,455,300c
NORTHROP AIRCRAFT, INC.	Hawthorne, Calif.	1,100,000	1,500,000e
RYAN AERONAUTICAL CO.	San Diego, Calif.	640,000	730,000
	TOTALS:	29,838,712	50,048,731i

a—add'l 271,470 sq ft planned by January 1, 1952.
b—add'l 360,000 sq ft planned by January 1, 1952.
c—acquired Navy-owned Curtiss-Wright plant.
d—add'l 130,000 sq ft at Fresno, Calif.
e—add'l facilities under construction; 750,000 sq ft to be added.
f—add'l 200,000 sq ft planned by January 1, 1952.
g—add'l 300,000 sq ft planned by January 1, 1952.
h—add'l 279,000 sq ft planned by January 1, 1952.
i—add'l 2,290,470 sq ft planned by January 1, 1952.

Employment in the two San Diego plants now totals about 19,000; that at Fort Worth exceeds 30,000. Of these about 5000 at San Diego are women; more than 4600 women are employed at Fort Worth.

The payroll for the first six months of 1951 was $45.0 million at San Diego.

Douglas

Douglas Aircraft Co., one of the Nation's largest aircraft producers during World War II, has outgrown its three southern California plants, and is adding factory space nearby while preparing a fourth major plant for large-scale production at Tulsa, Okla.

The story of plant expansion is apparent in the increase of production area in the southern California plants from 5,647,109 sq ft in 1948 to 6,454,654 sq ft in mid-1951. Plant area is shown as follows:

	Sq ft—1948	*Sq ft June 30, 1951*
Santa Monica, Calif.	2,499,091	2,622,403
El Segundo, Calif.	1,643,913	1,732,586
Long Beach, Calif.	1,504,105	2,099,665
Tulsa, Oklahoma	*(inactive)*	2,041,401

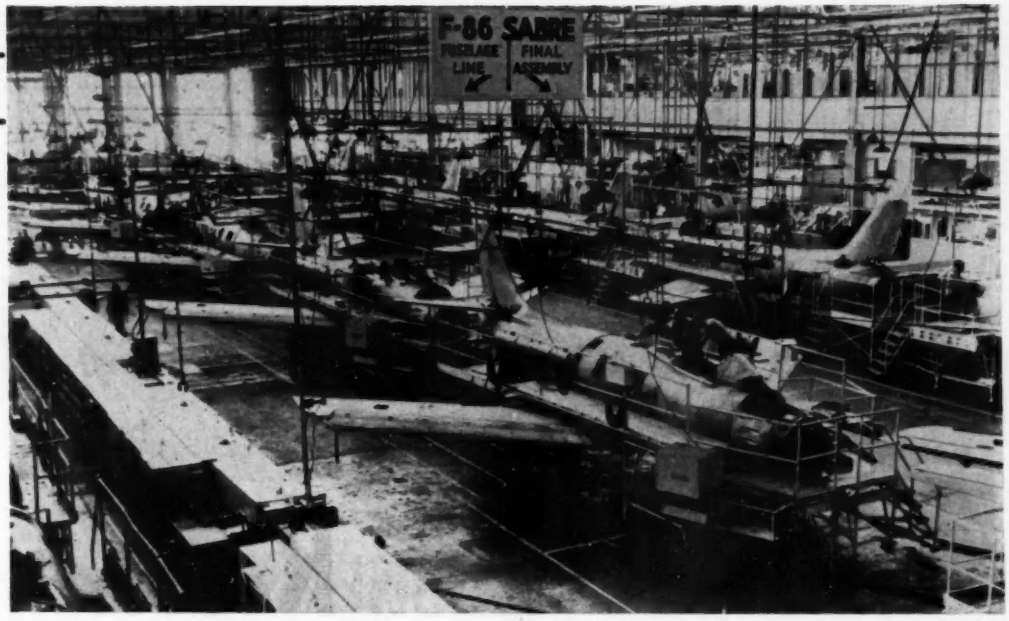
Productivity of the increased areas may be gaged by the growth of personnel:

	June 30, 1948	*June 30, 1951*
Santa Monica, Calif.	5,891	13,841
El Segundo, Calif.	5,852	10,179
Long Beach, Calif.	2,699	12,301
Tulsa, Oklahoma	*(inactive)*	1,610
Total	14,442	37,931

Annual payrolls, naturally, reflect the increase in numbers of employes as well as rising rates of pay:

	1948	*Six months 1951*
Santa Monica, Calif.	$23,668,283	$25,941,951
El Segundo, Calif.	20,453,142	19,648,281
Long Beach, Calif.	9,880,643	21,778,345
Tulsa, Oklahoma	*(inactive)*	*(not available)*
Total	$54,002,068	$67,368,577

Douglas Aircraft Company's sales generally parallel the business curve of the entire industry. In 1948, sales totaled $118.6 million, of which $69.7 million was to the military and the remaining $48.9 to commercial airlines. During the first half of fiscal 1951, Douglas sales totaled $97.2 million. The



New F-86E Sabre jet fighters on the production line at North American Aviation, Inc.

July 1, 1951, backlog of $786.7 million was divided into 86 per cent military orders and 14 per cent civilian. The figure given represents firm contracts. Letters of intent gave expectation of orders totaling over one billion dollars.

The backlog represents purchases of DC-6B and DC-6A four-engined commercial transports, the latter a cargo version of the passenger airliner, and a variety of military aircraft.

The DC-6 type transports, which include the R6D-1 Navy version and C-118A Air Force configuration, are produced at the Santa Monica parent plant. The Santa Monica Division is also turning out R4D-8 twin-engine transports, a modernized version of the DC-3 military aircraft, and is making subassemblies for two other aircraft produced by the company's southern California factories.

One of these is the large C-124A Globemaster II, largest production transport in military service, which the Long Beach plant is producing for the Air Force. The other is the twin-jet F3D Skynight, one of the Navy types in production at the company's El Segundo plant. The El Segundo Division also is turning out quantities of the AD-Skyraider series of attack planes, and is preparing to produce the A2D Skyshark, turbo-propeller airplane designed as a successor to the Sky-raider.

In addition to these airplanes the Douglas Santa Monica Division has production orders for two types of guided missiles. One is a ground-to-air anti-aircraft weapon in production for the Army Ordnance Corps, and the other an air-to-air missile being produced for the Navy Bureau of Aeronautics.

To meet the growing need of workers, the company has increased the number of women employed. The three southern California plants show the following growth:

	1948	*June 1951*
Santa Monica	984	3,196
El Segundo	1,063	1,701
Long Beach	455	2,259
Total	2,502	7,156

Hiller Helicopters

Total production of Hiller Helicopters at Palo Alto, Calif., is going to the military. The company has a backlog of over $20 million. Organized in 1948, the company started with 36,000 sq ft, about 50 employes, and a payroll of $20,000 monthly. Today's monthly payroll is approximately $180,000 for the 465 employes. The company is expanding its facilities so that by year end it expects to have 100,000 sq ft, including a 20,000 sq ft plant in nearby Redwood City, and about 1000 employes.

Hiller converted its commercial model 360 into the HTE training helicopter for the Navy, and the H-23 evacuation type helicopter for the Army.

The company recently established a separate new division for research and development in the field of advanced design helicopter jet engines. Research and test facilities which were previously used in the development of the company's ram-jet Hiller Hornet are

(*Turn to page* 102, *please*)

Here is a 1/10th scale model of the XP5Y-1 in flight, radio-controlled by the pilot who operates the console on beach at right. This self-propelled, dynamically-similar model of the XP5Y-1 weighed more than 125 lb and was powered by four gasoline engines developing 1½ hp.

Research World's First

By Ernest G. Stout

Assistant to the Chief Engineer, Consolidated Vultee Aircraft Corp.

Jet propelled, supersonic, water-based aircraft—incorporating the proved aerodynamic advantages of the Consolidated Vultee-developed delta wing and the entirely new hydrodynamic concept of a blended wing-and-hull design—merit serious consideration in strategic planning. Through a new blended wing-hull design approach, coupled with the development of an extremely effective water spray suppression device known as a spray dam, it has been possible to water-base idealized high Mach number aerodynamic forms without compromising hydrodynamic performance, seaworthiness, or stability.

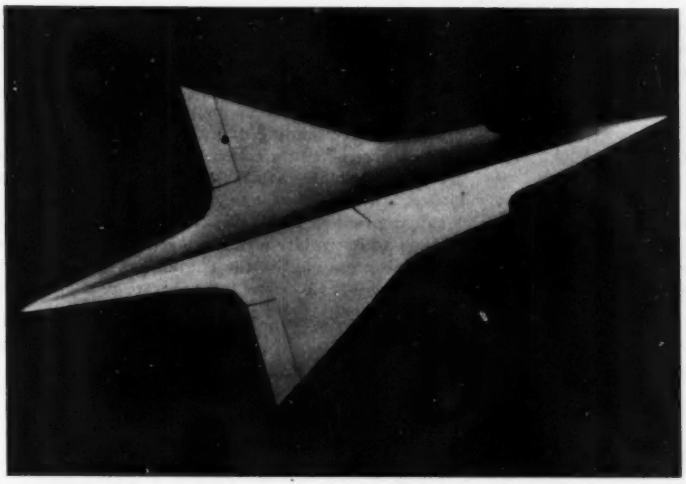
By utilizing jet power plants, it has been demonstrated that water-based aircraft can be developed into efficient and dependable transonic and supersonic aircraft. With our research program well into the considerations of supersonic design, it is safe to say that the probability of achieving the original objective of this effort is excellent, and it is not too early to take serious cognizance of this versatile new weapon and give high-speed water-based aircraft serious consideration in strategic planning.

The blended-hull, or other suitable aerodynamic forms of high critical Mach number, can be developed that will exhibit hydrodynamic performance characteristics equal to, or in many cases exceeding, the highest standards of current seaplane design. Such a development should go far toward substituting scientific strategic planning for the defeatist attitude represented by the outmoded classical argument of "Seaplane vs Landplane."

Dynamic Model Research

The Navy's Convair-built XP5Y-1, world's first turboprop-powered seaplane now undergoing flight tests, is the first full-scale airplane developed from Convair's dynamic model research program. The self-propelled, radio-controlled, dynamically-similar model of the XP5Y-1 was one-tenth scale, weighed more than 125 lb, and was powered by four midget gasoline engines developing 1½ hp. It made more than 2000 test runs.

The adaptation of transonic aircraft design to water-based operation—without sacrificing any of the high standards of hydrodynamic performance that were introduced into seaplane design during



Looking up toward the bottom of a dynamically-similar flying model, this view shows a Convair-developed delta wing, supersonic, blended-wing-and-hull configuration which incorporates a 60-deg. deadrise in the hull, indicated here in the form of the letter V.

That Produced Turboprop Seaplane

the first stages of our research program—indicated that a radical approach was necessary.

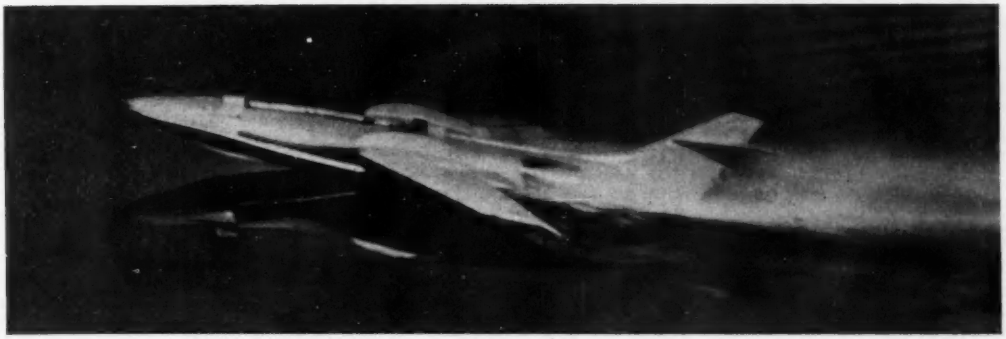
It appeared logical to start with an ideal aerodynamic configuration, and by means of extensive hydrodynamic research, develop new principles and applications which, though different in concept, result in the same degree of seaworthiness and stability normally associated with the best hulls of conventional form.

It was obvious that the basic "in flight" configuration must consist of a smooth, unbroken form utilizing high critical Mach number sections throughout. In order to secure elementary flotation, it would be necessary to supply sufficient volume of body so that engines, air inlets, jet exhausts, and personnel would not be inundated by water.

The combination of these two fundamental requirements and the preliminary data obtained from the XB-46 studies which adapted Convair's four-jet XB-46 Air Force bomber into a jet-propelled water-based aircraft indicated that a form of spray dam could be developed to efficiently separate and control spray from a smooth surface free of abrupt discontinuities. This led logically to the blended wing-hull configuration as the most promising approach to the basic problem.

It was also established that this elementary floating body, by virtue of its inherent low center of

This high-speed test run of a radio-controlled, dynamically-similar, free-flight, water-based model of a blended-wing-and-hull configuration. The model is self-propelled with dynamically-similar pulse jet engines.



gravity and high water-plane inertia, would float upright on the water surface without recourse to auxiliary flotation devices such as wing tip floats. By proceeding in this logical manner, it became increasingly apparent that a true aerodynamic form could meet adequately, or in some cases exceed, many established hydrodynamic design criteria.

Project Skate

With blended-hull configuration that satisfied the requirements for transonic flight and elementary flotation, the Convair Hydrodynamics Laboratory initiated "Project Skate" involving eventually a series of nine dynamically-similar model configurations.

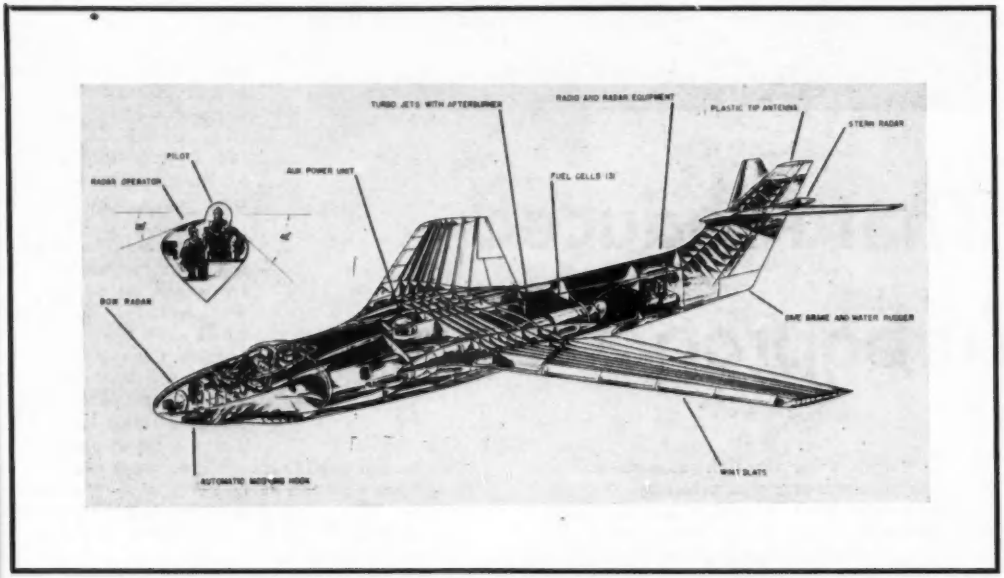
These models were used to study the problems incident to the blended-hull concept, such as water separation and control at the boundaries of the craft's planing surfaces, its hydrodynamic stability during takeoff and landing, waterlooping, low speed maneuverability, and similar characteristics.

The blended-hull configuration has its center of gravity below the metacenter: i. e., it has ship stability, consequently its tendency to roll and the magnitude of roll under identical conditions of wind and sea will be considerably less than that of the conventional seaplane. While the overall impression one forms of the blended-hull configuration is that it is an aircraft of radical design, close scrutiny discloses that it is actually a unique integration of a large number of sound, well-established hydrodynamic principles into a new basic concept. The best results of all recent research will be found in these designs cleverly applied to fundamental principles of long standing and known superiority.

With precise radio control and dependable scale jet power plants available for flight-testing the models, the research analyst can accurately flight test many radical new configurations in a short space of time and at relatively little cost. Each integrated model program can be the equivalent of a three-to-six-year full-scale prototype program under the old procedure. Inasmuch as the major portion of the problems involved in water-basing supersonic aircraft is in the subsonic stages of such operation and largely involves the integration of a suitable transitory landing device into a basic aerodynamic configuration, there is every reason to believe that a satisfactory supersonic solution is merely a matter of time and fully within the capabilities of current research techniques and facilities.

In view of Convair's broad background and experience with the world's first delta wing aircraft, it was natural that such an aerodynamic configuration should be employed in the supersonic hydrodynamic research program. The hydrodynamic configuration offering the least compromise with statics

(*Turn to page* 134, *please*)



Typical internal arrangement of a fighter-bomber version of a transonic water-based aircraft showing the adequate space provisions made possible by a blended-wing-and-hull configuration. Such a seaplane would be feasible, tests by Convair's Hydrodynamics Laboratory indicate.

By Marcus Ainsworth

1951 Vehicle Registration Will Exceed 51.4 Million

As of the end of the 1951 motor vehicle registration year, total motor vehicle registrations in the United States will be in the neighborhood of 51,400,000. In addition to these registered vehicles there will be approximately 600,000 Federal, State and local Government vehicles bringing the total of motor vehicles which have been in use throughout 1951 up to approximately 52,000,000.

It is estimated that registrations of motor vehicles during 1951 will number 51,413,293 as compared with 48,271,690 during 1950, a percentage gain of 6.5. Of

(*Turn to page* 150, *please*)

Forecast of 1951 Motor Vehicle Registrations

As of the End of the 1951 Registration Year

	Passenger Cars(1)		Trucks		Buses		Total Motor Vehicles		Per Cent Increase
	1951	1950	1951	1950	1951	1950	1951	1950	
Alabama	833,570	494,000	169,132	161,799	1,535	1,416	662,535	618,699	7.07
Arizona	258,165	234,562	89,727	82,727	708	682	348,200	344,324	6.67
Arkansas	534,535	500,357	116,166	146,383	2,750	2,566	453,751	423,943	5.43
California (2)	4,541,500	3,940,500	827,000	473,667	(3)	(3)	4,768,500	4,422,167	7.82
Colorado	495,000	452,300	169,000	161,200	(3)	(3)	664,000	613,594	8.07
Connecticut	643,000	602,170	94,000	87,170	1,720	2,700	741,333	673,142	10.11
Delaware	92,000	85,000	23,000	20,000	(3)	(3)	115,000	105,000	7.62
District of Columbia	174,700	164,211	19,000	16,372	2,000	1,964	196,200	182,147	6.67
Florida	888,740	826,000	182,000	170,343	2,000	2,000	1,077,240	998,113	9.23
Georgia	781,000	691,467	204,000	192,000	4,500	3,000	985,500	897,996	9.70
Idaho	224,000	163,000	71,000	71,000	(3)	(3)	270,000	234,000	4.50
Illinois	2,412,000	2,231,000	339,000	321,733	6,000	6,000	2,757,000	2,644,833	5.00
Indiana	1,240,000	1,172,027	233,000	244,242	7,000	7,710	1,332,000	1,423,000	6.42
Iowa	804,000	670,000	193,000	181,748	(3)	(3)	1,000,000	1,000,394	3.72
Kansas	672,000	640,000	204,000	196,720	(3)	(3)	886,000	837,394	5.80
Kentucky	846,000	804,000	176,000	167,000	2,000	1,000	923,000	772,400	6.99
Louisiana	695,000	652,767	163,000	161,700	3,000	3,047	761,000	708,100	7.37
Maine	218,734	210,434	54,000	50,100	473	394	281,700	273,000	2.43
Maryland	622,000	578,000	104,000	95,000	4,000	3,000	731,000	676,732	8.03
Massachusetts	1,170,000	1,102,574	170,000	168,000	6,000	5,431	1,346,000	1,271,005	5.84
Michigan	2,201,000	2,170,000	330,000	304,000	(3)	(3)	2,570,000	2,400,401	7.17
Minnesota	997,000	944,272	202,000	190,000	3,000	3,000	1,202,000	1,130,007	6.38
Mississippi	393,000	360,000	140,000	120,000	4,000	4,124	477,000	440,000	8.39
Missouri	1,000,000	898,000	198,000	201,007	(3)	(3)	1,204,000	1,101,077	9.75
Montana	253,000	170,000	67,000	70,000	(3)	(3)	277,000	240,000	6.30
Nebraska	455,000	442,000	156,000	153,000	1,100	1,077	612,100	597,000	4.69
Nevada	82,000	69,772	19,000	16,000	(3)	(3)	81,000	74,700	8.00
New Hampshire	143,000	130,000	30,000	28,347	(3)	(3)	182,000	170,394	6.70
New Jersey	1,410,000	1,344,000	317,100	303,700	9,007	10,440	1,943,017	1,863,700	6.12
New Mexico	170,000	160,000	67,000	63,100	1,310	1,040 (3)	238,705	224,040	5.00
New York	3,400,000	3,200,000	554,000	471,000	16,000	16,000	4,000,000	3,707,370	7.31
North Carolina	838,420	699,000	210,414	201,000	5,200	5,200	1,100,044	1,005,000	10.04
North Dakota	107,000	101,000	30,000	31,000	100	100	284,700	273,276	4.59
Ohio	2,000,000	2,000,114	331,000	317,000	(3)	5,000	2,000,000	2,007,372	9.00
Oklahoma	647,100	610,000	213,000	201,100	1,700	1,000	861,000	809,331	4.00
Oregon	650,000	600,000	160,000	150,000	1,000	1,000	760,000	670,100	6.17
Pennsylvania	3,000,000	2,870,270	500,000	500,000	13,000	12,000 (3)	3,222,700	3,000,000	4.39
Rhode Island	224,100	210,710	32,100	30,000	900	900	257,000	247,140	4.27
South Carolina	462,100	446,000	110,700	108,167	4,000	4,667	603,304	559,000	8.21
South Dakota	221,010	210,000	75,401	70,000	300	300	297,711	280,301	5.00
Tennessee	800,000	600,000	160,000	153,000			670,000	600,371	6.17
Texas	2,400,000	2,310,270	601,100	612,000	6,100	6,000	3,000,000	2,000,012	4.39
Utah	210,000	200,014	47,000	46,117	600	600	260,000	246,731	5.41
Vermont	107,000	100,000	15,000	14,011	107	100	122,107	110,100	5.40
Virginia	616,140	702,000	170,000	160,000	2,000	2,000	804,200	800,100	6.00
Washington	704,000	745,720	160,000	166,700	2,000	1,747	866,000	803,179	8.13
West Virginia	342,000	331,010	111,000	101,301	1,000	1,337	454,000	427,214	6.30
Wisconsin	1,011,000	967,414	220,000	211,000	2,000	2,010	1,247,720	1,181,000	6.01
Wyoming	112,270	103,177	42,730	39,047	.....	.....	155,000	141,010	9.36
Total	42,847,300	39,982,000	8,725,400	8,166,040	132,594	132,773	51,413,293	48,271,690	6.51

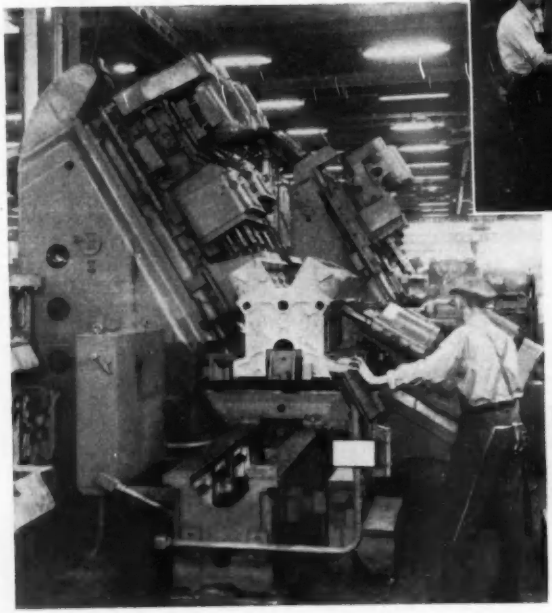
(1) Includes taxicabs. (2) Data do not include 189,534 passenger cars and 7,912 trucks non-resident registrations for 1950 and 191,000 passenger cars and 8,100 trucks for 1951. (3) Included with trucks.

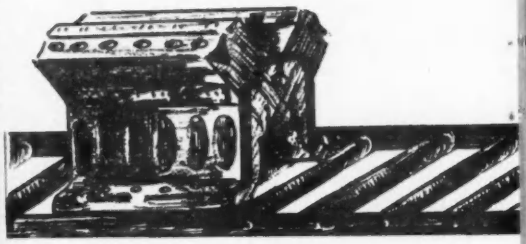
Building and Testing

A picture story of the new equipment at the Diesel engine plant of the Caterpillar Tractor Co., Peoria, Ill.

Caterpillar V-8 and V-12 cylinder blocks are drilled in this enormous Natco multiple-drill press. Fitted with 111 spindles, it does all of the drilling on pan face of the block as shown. Work is moved into the large, massive fixture with cylinder banks riding on the V-type gravity roller conveyor.

Drilling of cylinder head surfaces and sides of V-8 and V-12 cylinder blocks is done in the special way-type W. F. & John Barnes drilling machine seen here. It has two high inclined heads—each with a cluster of 16 spindles—for the cylinder bank; and the two smaller heads on the opposite side. Since this setup handles one side at a time, it is necessary to run the block through each cycle to complete one side; then the block is moved out of the fixture, indexed 180 deg to present the other cylinder bank.

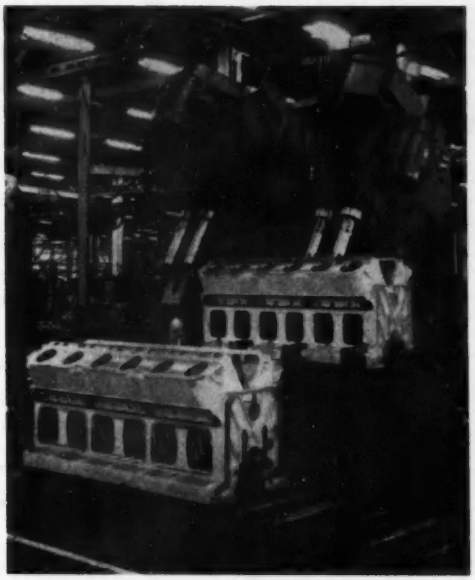




Caterpillar Diesel Engines

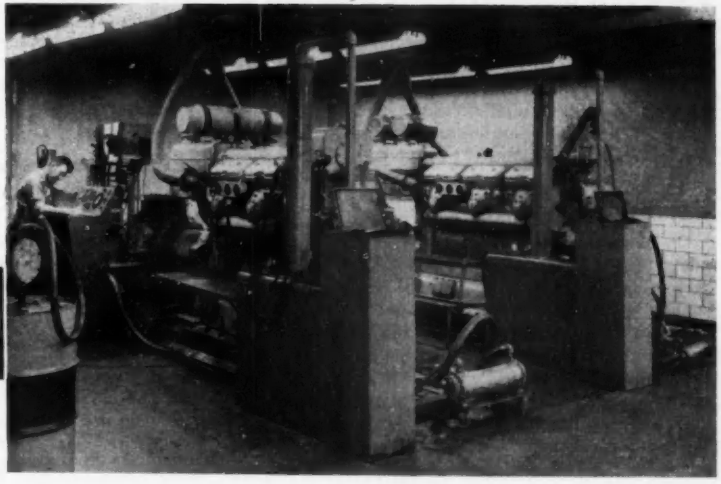
THE enormous — 925,000 sq ft — Caterpillar Diesel engine plant which commenced operation late in 1948, was described in some detail in AUTOMOTIVE INDUSTRIES, February 1, 1949. Since then the operation has been greatly expanded and features the addition of considerable equipment not installed in the beginning. Of particular interest are the three large machines illustrated here. They are employed in the machining of V-8 and V-12 Diesel engine cylinder blocks and from that standpoint represent items of familiar equipment blown up to giant size.

The isolated assembly department, described in the previous article, has been fitted with a large number of dynamometer rooms, each one equipped with two complete stands for testing two engines at a time in each booth. Among the photographs shown here is a view in one of the larger dynamometer rooms, handling the big V-8 engines.



Immediately preceding drilling operations, the V-8 and V-12 cylinder blocks are rough- and finish-bored, in sequence in the big, inclined-head W. F. & John Barnes boring mills shown in this view. Since each unit has only two heads, it becomes necessary to index V-8 blocks forward twice, and V-12's three times, to complete each phase of boring for each bank. Then the block is moved out of the machine and turned 180 deg to present the other bank for the same sequence of operations.

View of one of the test cells in the dynamometer section of the K-K assembly department. It is equipped to handle V-8 and V-12 engines and, like the other booths, can test two engines at the same time.



The BUSINESS PULSE

Early Phase of the Defense Program is Over. Advance in Defense-Related Production is Offsetting Reduction in Output of Consumer's Durables. Business Planning Has Discounted Future Effects of New Tax Law.

Industrial Output Moderating

The upward trend many business analysts had expected to develop in the fall still has not appeared. Industrial output is apparently increasing, though only moderately, led by defense and allied production. On the other hand, many consumer lines are hard put to remain firm at the lower levels established during the summer. Department-store sales declined more than seasonally in September, as did employment. Most price indices are moving upward. Consumers' prices showed a fractional advance in September. The index of wholesale commodity prices compiled by the Guaranty Trust Co. rose 2.5 per cent in the month ended October 15. Amid such mixed tendencies there are, nevertheless, certain trends of potential significance.

This Survey is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Accumulating data suggest that the early phase of the defense program, marked by rapidly advancing levels of production, income, and profits, is over. A full description, of prediction, of what is to follow would be extremely hazardous in a defense-geared economy, but fragmentary evidence would seem to indicate that most sectors of the economy are slowing down, adjusting, and taking a second look. This includes consumers at the retail level. Inventory adjustments are bringing stocks into better alignment; personal income and capital expenditures are advancing at a slower rate; corporate profits are receding in the face of greater tax bites.

Period of Stability

On balance, these factors suggest to many economists that the country has entered a possibly brief period of relative stability. Production in many consumers' good industries has been cut back to a level consistent with current demand, and efforts to clear away high inventories have begun to take effect. The seasonally adjusted book value of inventories at the end of August was $200 million below the total for July, after gaining steadily for more than a year. Although durable manufacturing inventories increased about $650 million during August, the rise was more than offset by a decline of $850 million in retailers' and wholesalers' stocks. It is significant that the rise in durables mainly represented increases in working stocks. There was apparently little involuntary accumulation.

The pattern of activity in basic industries reflects the demands imposed by an ever-encroaching web of Government. Allocations of materials and Federal contracts now mainly determine levels and kinds of production in various industries. Military demand has grown to a point where the advance in defense-related production is currently offsetting the reduction in output of consumers' durables.

The importance of Federal activity in many industries is illustrated by current construction data. Total construction put in place in September is valued at $2.8 billion—only about one per cent less than that in the preceding month and one per cent below the comparable figure last year. Yet residential construction has apparently leveled off at about 70 per cent of last year's record rate, and private construction as a whole is running about 11 per cent below comparable figures for last year. Government spending for construction, on the other hand, continues to rise. Military and naval construction completed during September was 462 per cent greater than the value of such construction a year earlier, and public industrial construction was 370 per cent greater in value.

Effects of Defense Production

Construction is illustrative of only one effect of the deep inroads defense production is making into materials normally available for consumer-goods production. Washington officials connected with the Defense Production Administration indicated in October that supplies of some commodities will be so short during the next half year as to force some "nonessential" firms out of business. Such fabricators using copper have been flatly advised to "get out" and convert to other products. Within industry, however, there appears to have formed an undercurrent of skepticism. While it is conceded that improvement in the supply situation

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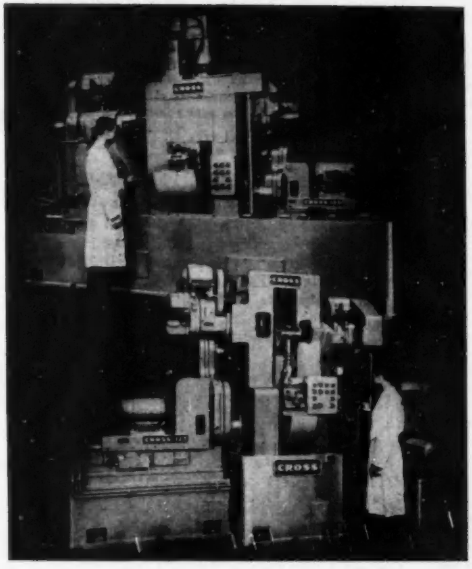
• PRODUCTION • NEW EQUIPMENT • PLANT •

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 62

E-74—Multi-Operation Machines

A unit of two special machine tools for processing transmission extensions has been created and built by The Cross Co., Detroit, Mich. They can finish 125 pieces per hour at 100 per cent efficiency. The first machine is a four station trunnion type with fluid motor, power indexing. A single point tool is used for cross facing the flange at the large end. An automatic balancing mechanism is employed for the cross facing slide. At this machine, both ends of the extension are bored, the large end is faced, the flange holes in the large end are reamed, an oil groove is machined in the small end, and two holes are chamfered and tapped in the mounting pad.



Cross trunnion type machines for transmission extension.

Machine number two is a six station trunnion type and, like the first machine, has fluid motor, power indexing. In the second machine, the mounting flange is milled; the speedometer hole is drilled, bored, chamfered and tapped; and two inspection cover holes are drilled, chamfered and tapped.

Other features of both machines include: hardened and ground ways, J.I.C. standard construction, lead screw feed for tapping and hydraulic feed for drilling, boring and reaming.

E-75—Honing Machine

Guided type tools and automatic machines have been developed by the Micromatic Hone Corp., Detroit, Mich., for productively honing main bearings

(*Turn to page 56, please*)

News of the Machinery Industries

Gear Makers Meeting

The American Gear Manufacturers Association semi-annual meeting, held in Chicago from October 29th to 31st inclusive, was highly successful from the standpoint of the technical material discussed and the large attendance at the numerous meetings. Most of the committees established by the gear makers are working on various gear standards—these standards set forth and discussed are as yet in the proposal state. A great deal of interest was shown in the progress report made by the gear rating coordinating committee.

At the semi-annual banquet, Newbold C. Goin, former executive secretary of the AGMA—AUTOMOTIVE IN-

(*Turn to page 70, please*)

Metalworking Machinery — Except Machine Tools:— Quantity and Value of Shipments by Class of Product, 1947 and 1950

(Thousands of dollars)

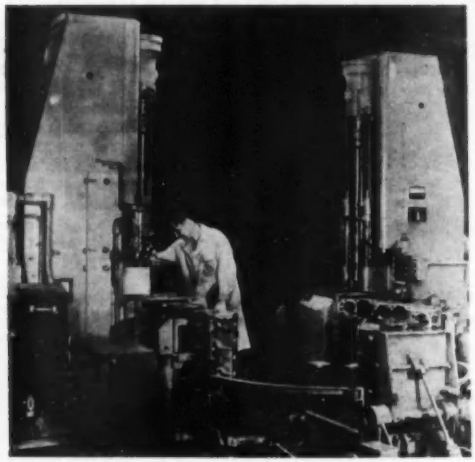
Class of Product	1950		1947	
	Number	Value fob Plant	Number	Value fob Plant
Presses (including forging)	14,900	76,378	n.a.	109,163
Forging machines (except presses)	1,314	10,452		
Punching and shearing machines (power)	3,556	13,841	4,307	12,552
Punching and shearing machines (manual)	5,055	1,087	n.a.	n.a.
Bending and forming machines (power)	6,670	19,068	n.a.	22,239
Bending and forming machines (manual)	17,832	2,719		
Riveting machines — except hand-held portable type	2,916	3,070	n.a.	3,348
Metal-container making machines	2,134	12,571	2,548	16,278
Die-casting machines	312	4,668	397	4,246
Wire-weaving and wire-fabricating machines	761	3,224	n.a.	6,881
Drawing machines and draw benches	374	3,962	n.a.	10,193
Metalworking Machinery, Total	.....	$161,628	.....	$184,998

n.a.-Not available

• PRODUCTION • NEW EQUIPMENT • PLANT •

For additional information regarding any of these items, please use coupon on page 62

(*Continued from page* 55)



Micromatic Hydro-honers, model 740.

to 0.0005 in. total tolerance for alignment, size, roundness, and straightness.

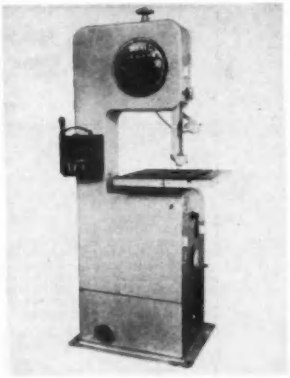
This equipment is capable of honing main bearings in V-8 cylinder blocks at the rate of over 60 blocks per hr. The operation is entirely automatic. Automatic Microsize controls the honing cycle for each block and indicates which column of the two column unit is to receive the block from the line. A stone wear indicator shows when the abrasives should be changed.

Alignment is generated by a special guided tool. The tool has one bank of abrasives and seven banks of plastic guides. The same abrasives stroke through all the bearings. Guides are spaced so they stabilize the tool as the abrasives pass from bearing to bearing. Guides are forced out radially by the same cone (wedge) that applies pressure to the abrasives. The plastic wears down with the abrasives and maintains a large area of contact with the bearing surfaces.

E-76—Bandsawing Machine

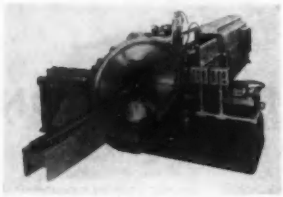
The DoALL Co., Des Plaines, Ill., is offering a 16-in. throat by 12-in. thickness capacity light duty bandsawing-filing-polishing machine of unit welded steel construction. This model, SFP, provides both high and low tool speed ranges. Speed is infinitely variable by handwheel control and two-speed geared transmission from 50 to 300 fpm and from 860 to 5200 fpm.

Like the widely used tool room model ML, this newer machine includes a saw band welder. It also includes such standard DoALL features as the job selector dial and Speedmaster drive. A handwheel controlled automatic power feed with pedal release is optional equipment along with a wide assortment of guides and attachments to fit the machine to the job. It takes all standard saw bands up to ½-in. width, file bands ⅛-in., ⅜-in. and ½-in. width, and ¾-in. polishing bands.



DoALL bandsawing machine, model SFP.

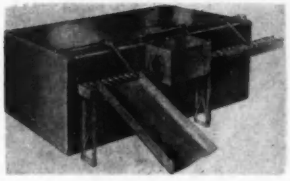
E-77—Broaching Fixture



Conventional horizontal broaching machines put out by Lapointe Machine Tool Co., Hudson, Mass., can now be equipped with a special broaching fixture. This fixture has been designed to accommodate all sizes of stator rings from 38 in. to 48 in. diam. It makes possible the broaching of 40 to 100 slots in stator rings at a production speed of 35 sec per slot. The fixture is built with adjustable travel of 15 in. hydraulic index, hydraulic plunger, and fully automatic lubrication. The broaching machine on which this fixture is mounted is the horizontal Lapointe HP-40, 20-ton, 90-in. stroke, with conventional high speed return.

E-78—Induction Furnace

Loftus Engineering Corp., Pittsburgh, Pa., has developed a 60 cycle induction furnace for the heating of nonferrous metals and some applications of steel. The furnace is said to provide absolute uniformity of heating and at the same time assures balanced electrical loading from a three phase line.



Loftus induction furnace.

Process involves a transformer which converts balanced three phase power into two phase operation. Two closely interlaced coils, leading off this two phase line surrounds the billet. Eddy currents are caused to flow in the billet to be heated. The furnace itself is built to the customer's specifications and is designed for any size or shape of billet and may be equipped with as many coil units as are necessary to meet production requirements.

E-79—Power Press Brake

Expansion of its power press brake line to include a complete range of sizes from 120 to 1000 tons capacity for forming mild steel from 3/16 to one in. thick, six to 20 ft long, has been announced by the Columbia Machinery and Engineering Corp., Hamilton, Ohio.

(*Turn to page* 60, *please*)

"Let's try it without the stretcher levelling," said Art

For some time, an Inland Customer, who makes farm implements, had been buying 62½" x 128" sixteen gage cold rolled sheets for a certain part and had always specified that they be stretcher levelled and resquared to insure extra flatness.

The process of stretcher levelling and resquaring at the mill added substantially to the cost of the cold rolled sheets. Art Brackett*, the Inland sales representative on this account, questioned the need for this costly operation.

One day, on a visit to the customer's plant, he asked to take a look at the part being fabricated from this large sheet. He found that the stretcher levelled and resquared sheets were shipped from Inland to an independent fabricator for blanking. They were then shipped to Art's customer who further fabricated them and welded on bracing and framing sections before assembling them on his implements.

In talking to his customer's purchasing agent and production manager, Art suggested that the extra flatness achieved by stretcher levelling was lost by the time the sheet was assembled on the finished product and was, therefore, unnecessary. The customer changed his steel specification for this part, eliminating stretcher levelling and resquaring.

Result: A saving for Inland's customer of over $4.00 per implement—a saving that has already run into thousands of dollars! INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago 3, Illinois.

Making Steel Do Your Job Well Is Inland's Job.

*Names used are fictitious

Your Scrap is Needed by the Steel Industry for National Defense

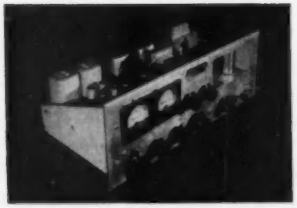
NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 62

F-102—Binaural Amplifier

Magnecord, Inc., Chicago, Ill., has completed a binaural tape recorder for the location of original sound.

In binaural recording the listener's ears are selective in locating the origination of sound. Binaural recording is accomplished by recording the original sound through two separate microphones placed about six in. apart. Each of these microphones records on a separate side or channel of standard ¼-in. sound recording tape. Since the two channels are recorded at the same time and reproduced simultaneously through two separate speakers and/or two separate headphones, the effect is that of the listener actually being present at the time the recording was made.



Magnecord binaural amplifier.

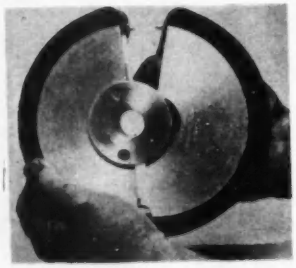
For research in vibration, noise and multi-sound phenomena, the binaural recording system may be used as a research tool in the laboratory or on field testing setups. It may be used for dual channel research where there is a need for recording of any two or synchronous functions. Too, the output of a system under test may be recorded on one track of tape while commentary or description of the experiment is recorded in the experimenter's own voice on the second tape. Magnecords binaural system also permits a time signal to be simultaneously recorded instead of the accompanying voice narration: also a function may be recorded on one channel and an automatic volume control or ground noise reduction signal may be recorded on the second track.

F-103—Plastic Blowers

In the electric motor field, plastics are now being used to replace critical aluminum and bronze for blowers in small, totally-enclosed, fan-cooled a-c motors. The plastic blowers consist of a polyester resin reinforced with glass fibers.

Preliminary tests indicate that the plastic blower has excellent resistance to abrasion. Westinghouse currently is applying these new plastic blowers to totally-enclosed fan-cooled Life-Line motors in NEMA frames 254 and 284 (five and 7½ hp, 1750 rpm). They will be applied to other motors later.

F-104—Drum Sander

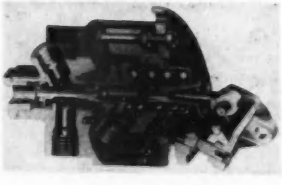


Cone-Loc drum sanders are now being sold exclusively through The Carborundum Co., Niagara Falls, N. Y., according to an nouncement from American Diamond Saw Sales, Portland, Oregon, producers of the industrial tool.

The Cone-Loc drum sander is a cushion-type split drum which uses coated abrasives in strip form. The two sander halves are locked together by a locking cone when the arbor nut is tightened down. A backing flange has been recently incorporated as an integral part of the tool.

F-105—Air Brake Foot Valve

The Automotive Div., Wagner Electric Corp., St. Louis, Mo., has announced the release of a high-capacity air brake foot valve for heavy duty use on trucks and buses.



Wagner high capacity air brake foot valve.

Larger ports and a streamlined interior of the valve are said to expedite the movement of exceptionally large volumes of metered air to the power cylinders. The valve has a preloaded type metering spring which releases an approximate initial five lb of air into the system immediately. It is available in two designs; an actuating arm type for use with the existing pedal linkage and a treadle type construction for direct mounting on the floor board.

Complete valves are interchangeable with other valves now on the market. Both valves, the actuating arm and the treadle, are basically the same with interchangeable parts.

F-106—Mobile Inspection Unit

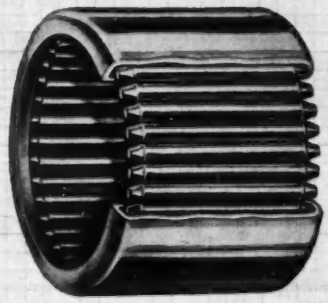
The DoALL Company has brought out a more compact mobile inspection cabinet for use with the mobile inspection system introduced several years ago. The unit is smaller, lighter.

DoALL mobile inspection unit.

The key to the inspection system is the mobile unit by means of which all of the inspector's tools and measuring instruments are moved from one location to the next. Mobile inspection unit is 37 in. high, 28 in. wide and 18 in. deep. It is constructed of heavy-gage welded steel and has a pressed wood top. There is a ledge around the top which prevents tool and gages from sliding off to the floor. The drawers are

(*Turn to page* 68, *please*)

smooth performance...



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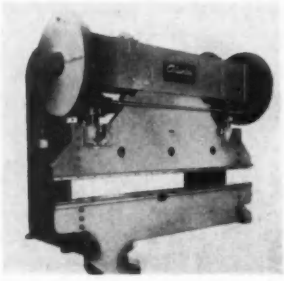
(*Continued from page 56*)

Numerous design improvements have been incorporated in all models, those of 350 tons capacity and larger having been largely redesigned. Notable among improvements on all models is a new wedge-type ram pressure release for releasing the ram in event of bottoming of the dies. It consists of a heavy steel wedge with the top angle complementing a similar angle on the base of the ram adjustment socket. Held securely in position by two cap screws, it can be released by unscrewing the cap screws and moved back to provide ¼ in. additional downward travel of the ram.



Columbia power press brake.

Models of 350 tons capacity and larger can be furnished with a two-speed transmission affording approximately four to one speed ratio and smaller models can be similarly equipped on order. Special throat depth, stroke and shunt height can also be furnished and all models can be equipped with air counterbalances and air-operated clutches, solenoid-actuated.

E-80—Lathes

American Pullmax Co., Inc., Chicago, Ill., has announced their exclusive sales representation in the United States for the line of Koping high speed lathes.

The line will include 16 in., 20 in., 24 in., 28 in., 32 in., 36 in. and 40 in. sizes. Koping lathes feature a disk type clutch for forward and reverse engaging of power. All shafts operate with roller bearings and a total of 18 different spindle speeds are available.

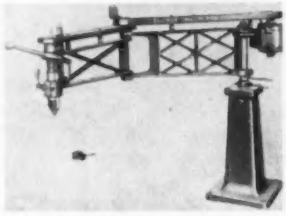
A selection of 40 feeds and threads are available. The movement of a tumbler and lever give direct readings for pitch, longitudinal feed and cross feed. As many as 271 different threads in both metric and American standards are possible.

Koping lathe being placed on the U. S. market by American Pullmax.

Certain models are also equipped with electrical gauges that indicate the amount of strain being put on the machine by the turning operation.

E-81—Radial Arm Drills

Ekstrom, Carlson & Co., Rockford, Ill., has reinstated their No. 30 (30 in.) and No. 71 (71 in.) radial arm drills to their line of production equipment for the aircraft industry. These units are designed for fast, light drilling and are said to be adaptable for both single piece and production runs.



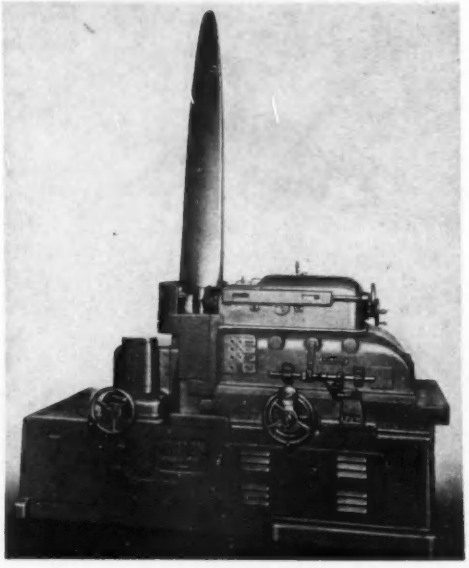
Ekstrom radial arm drill.

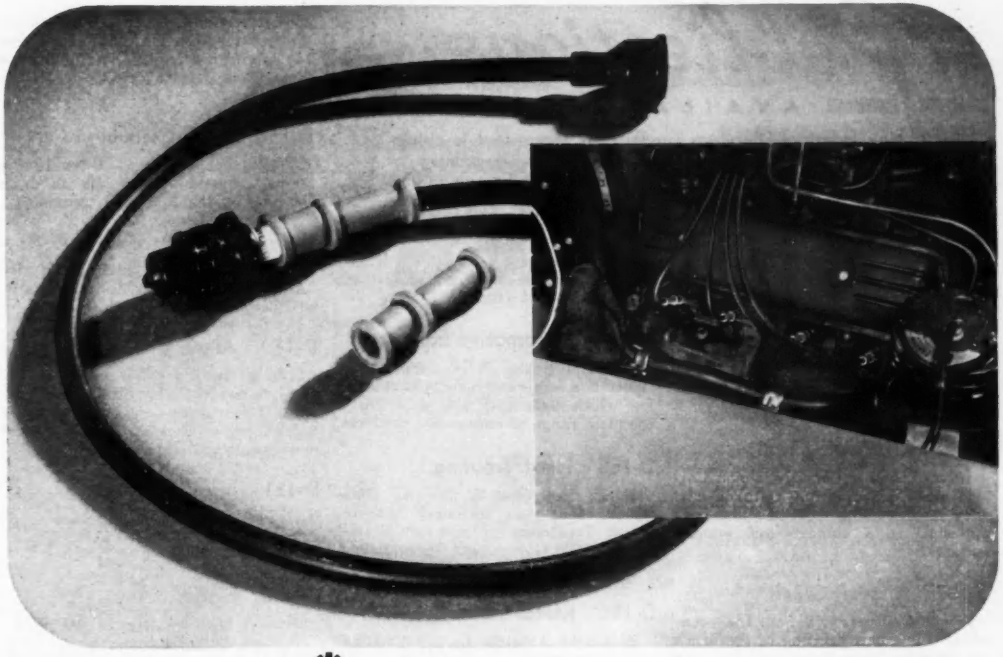
Available are four types of each of the two sizes and are as follows: Type A employs a large nut for mounting the complete unit on a table or stand. Intended for use at a fixed height only, no provision has been made for vertical adjustment. Type B embodies a threaded post and support bracket for mounting unit on a table or stand, but this unit can be vertically adjusted up to six in. Type C is identical in construction to type B except that it comes equipped with its own cast iron base. All of the above types have an inner spindle assembly which slides within an outer sleeve. This outer sleeve is fitted with the desired diameter drill bushing. Type D radial arm drills can be furnished in any of the three aforementioned mountings. It differs from

(*Turn to page 64, please*)

E-82—Propeller Hub Grinder

A machine to grind the external surfaces of the hubs of aircraft propeller blades, including ball race ways, has been put out by Norton Co., Worcester, Mass. A work-holding fixture on an antifriction bearing work spindle holds the blade in a vertical position and the required grinding is performed in this position. The wheel spindle is also of antifriction bearing construction and is mounted vertically. It has power positioning of the work spindle for ball race grinding operations, and power feed of the grinding wheel.





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D-150 Springs

Dudek & Bock Spring & Mfg. Co.—Recently made available is a four-page folder on springs. A table, "Manufacturing Variations for Coil Springs," is included for spring buyers and users in the automotive industries.

D-151 Cast Alloy Tools

Haynes Stellite Co., Div. Union Carbide and Carbon Corp.—Data on cast alloy metal-cutting tools has just been published in a 44-page tool manual and catalog.

D-152 Aircraft Steels

Joseph T. Ryerson & Son, Inc.—Announced is a new printing of the firm's Aircraft Steels booklet which includes revised military specifications to August 1, 1951.

D-153 Hot Spraying

Martin-Senour Co.—Hot spraying methods for automotive refinishing lacquers are discussed in a booklet, entitled "The Hot Issue."

D-154 Automotive Equipment

National Brake Block Corp.—Just issued is a comprehensive 24-page catalog which illustrates and describes a complete range of automotive products.

D-155 Heat Treating

E. F. Houghton & Co.—An illustrated, four-page technical bulletin, "Heat Treatment of Aircraft Steel," to meet U. S. Government Specifications MIL-H-6875, is being offered.

D-156 Metal Forming

Pastushin Aviation Corp.—An illustrated four-page folder has been issued on the Pastushin-developed metal forming process.

D-157 Tracer Control

George Gorton Machine Co.—"Applications of Tracer Control" is a 64-page book containing more than 200 photographic reproductions and more than 140 specific descriptions and production facts about a wide variety of production jobs.

D-158 Drum Cleaning

The Pangborn Corp.—Offered is a six-page brochure, No. 220, on drum cleaning by the Rotoblast technique.

D-159 Welding Electrodes

Alloy Rods Co.—A brochure, entitled "Alloy Welding Electrodes for Defense Production," has been released.

D-160 Alloys

Ampco Metal, Inc.—A completely revised 20-page bulletin, PI-3, gives complete information on Ampco alloys (aluminum bronze) as applied in corrosion-resistant service.

D-161 Hand Trucks

Howe Scale Co.—A 12-page Condensed Truck Catalog (Form 508-B) has just been released.

D-162 Gages

Pratt & Whitney, Div. Niles-Bement-Pond Co.—Recently published is a pamphlet on the company's AGD adjustable limit snap gages.

D-163 Air Conditioning

Sturtevant Div., Westinghouse Electric Corp.—Just published is a 16-page,

(*Turn to page* 124, *please*)

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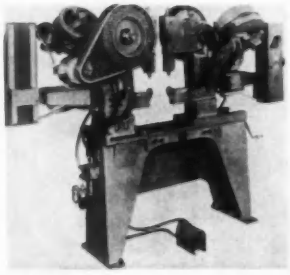
(Continued from page 60)

Types A, B, and C in that there is no outer sleeve and inner spindle assembly. Instead, the entire spindle assembly is actuated manually with a four-spoke hand lever by means of rack and pinion arrangement. An adjustable coil spring is provided to counterbalance the downstroke and facilitate return of the drill spindle to an up position.

Standard spindle speeds for the Type D are 2500 and 4000 rpm; but these can be modified, if necessary, to suit individual needs.

E-83—Double Clinchor Machines

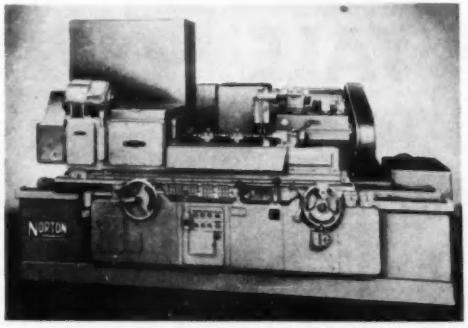


Double Clinchor units have been designed for use in the automotive industries by the Tomkins-Johnson Co., Jackson, Mich. The machines are tooled to feed and set two ⅜ in. by ½ in. by 3/16 in. thick Fabri-Steel nuts at each operation. The anvil position of the left hand Clinchor is adjustable in a front-to-back direction, and also with respect to height. The anvil position of the right hand Clinchor is adjustable in a left-to-right direction. Both Clinchors are tripped by the same foot-operated valve.

E-84—Automatic Cam Grinder

Norton Co., Worcester, Mass., has developed for their model two Cam-O-Matic automatic hydraulic cam grinding machine arrangements by which the tapers required on some automotive cam contours are automatically produced at normal high production efficiency.

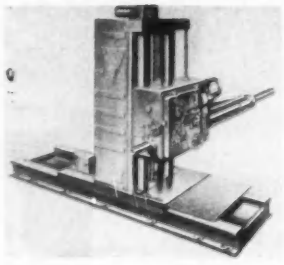
Tapers in either direction, or in both directions on the same shaft, are produced by these arrangements. In addition, whether the machine is arranged for grinding tapers in one or both directions, provision is made for grinding straight faced cams.



Norton Cam-O-Matic, model two.

Therefore, with the Cam-O-Matic machine arranged for grinding tapers in both directions, means are provided not only for handling present designs of cams, but for future requirements which may differ.

E-85—Horizontal Drilling and Tapping Machine



Kaukauna model 3040 horizontal drilling and tapping machine.

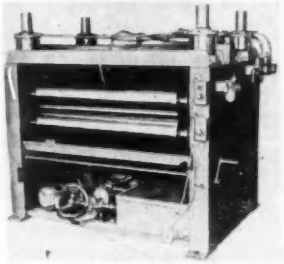
Column rigidity, unusual power, wide range of movements, simplified operation and power positioning are features claimed by Kaukauna Machine Corp., Kaukauna, Wis., for its horizontal drilling and tapping machine. It is designed to drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spot-facing operations.

The box type column is heavily ribbed, and the four in. diam spindle with 42 in. spindle travel slides in a hardened steel sleeve mounted in Timken taper roller bearings. The spindle drive motor may be from 10 hp to 20 hp and the spindle is fitted with No. 5 or No. 6 Morse taper with 18 speed changes through sliding gears.

The pilot wheel is internally clutched, overload protected and graduated to six in. for depth control drilling and tapping with automatic feed kick-out at the pre-selected depth. Headstock is completely counterweighted and has rapid traverse and electric inching through a power driven screw with the head traverse motor located on the sheave bracket. Traverse rate is 80 ipm and overtravel is prevented by limit switches.

Runway slides contain a three hp gear motor and worm reduction to traverse column along the runway. Rate of traverse is 80 imp with electrical inching controls for fine positioning. A screw-type runway slide clamp is interlocked electrically to pushbutton controls, and limit switches prevent overtravel.

E-86—Machine for Roller Coating



Union Tool Corp., Warsaw, Ind., reports roller coating machine models available in sizes to fit any stock up to 96 in. Function of the roller coater is to uniformly apply drawing compounds to sheet steel prior to the drawing operation. The machine shown is equipped with three pairs of rolls. First pair is of hardened steel and is used for deburring the stock. Second pair is neoprene-covered and is used for actual application of the compound. Third set of rolls is of hardened steel and is used primarily as squeegee rolls for wiping off excess compound and for forcing remaining compound into the pores of the metal. The machine is equipped with circulating pumping unit to feed the coating rolls.

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Sealed Power has been talking turkey to the automotive engineering world since 1931. We speak their language, and their desire for co-operation has kept Sealed Power at the head of the field. Today's Sealed Power facilities for rings, pistons, and sleeves are the finest in our history. You are urged to use the full resources of Sealed Power to help make your good engines even better.

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AIRBRIEFS

By ROBERT McLARREN

Aviation-clogged Industry

The Air Force has been steadily awarding production contracts for the past 18 months (more than ten billion dollars worth) to about everybody who can do anything and it seems now to be witnessing the first signs of having come full circle. It is well known that a single prime contract will, in turn, result in several hundred sub-contracts and several thousand supply contracts along the line. Ultimately, this process bumps up against itself and the beginnings of this enigma are already manifest. The result is that the Air Force cannot award a contract for Part A to Company A because it has previously awarded contracts for Parts B, C and D to Company B, which is getting them from Company A—and if this sounds involved that is exactly the way it is supposed to sound.

This is all-too-familiar in the accessory and small parts field but the industry is now getting so saturated that even such major items as airplanes and engines can no longer be procured. A case in point is the recent "unscheduling" of the supersonic Republic F-84F fighter on two counts: deliveries of the Curtiss-Wright J65 Sapphire turbojet engine cannot be made to its use in the Martin B-56 Canberra jet bomber; and the F-84F tapered-thickness wing skin was designed for forge-pressing and Wyman-Gordon has the only facilities in the country equipped for the production job. Unfortunately, Air Force had already saturated Wyman-Gordon through a sub-contract with the Boeing Airplane Co. for B-47 forgings as well as several other aircraft manufacturers. The result of this saturation is that the tremendously fast F-84F must simply be delayed one year while its wing is redesigned and Curtiss-Wright makes up for lost time due to its strike.

More NACA Ingenuity

For the past five years everyone concerned has pointed to heat-resistant materials as the major stumbling block to higher aircraft gas turbine engine powers and huge research budgets have been expended in the search. Super-hot alloys had just been developed when Korea broke out and the cry became: "Save strategic materials," which put an end to the new super alloys using rare metals. Thus, the problem was about back where it started when the NACA Lewis Propulsion Research Laboratory, Cleveland, came up with an attack on the other end of the problem: make the engines run cooler. By pumping cooling air through hollow turbine disks, rims and blades, NACA has demonstrated that operating temperatures can be cut almost in half with the saving available for either using non-critical elements and keeping the same temperatures or continuing the use of such elements and obtaining increased powers from the engines.

Turbine blade cooling was a German idea in World War II but NACA has developed greatly improved efficiencies and simplicities in fabrication. Air is pumped through the blading from the engine compressor and is then dumped overboard after use. In a typical case, a turbine blade operating in a 1400 F gas stream can be cooled to only 775 F by bleeding five per cent of the air from the compressor!

The Atomic Swim

We feel fully justified in plunging into the atomic speculation swim in regard to "baby A-bombs" since everybody is doing it and, also, we don't know anything about the subject either. However, we think it of interest to point out that every jet fighter now in operation is capable of carrying 2000 lb of bombs. The connection between this fact and the so-called "baby A-bomb" lies in the fact that it is generally recognized that the critical mass for fission is about 32 lb. The remainder of the bomb, in our estimation, consists of about 200 lb of operating mechanism and the rest is lead shielding.

If a fighter can lift a 2000 lb load made up of 32 lb of fissionable materials and 1768 lb of lead, we hardly see how the argument can center about reducing that 32 lb to say 20 lb or so. It seems to us that the 1768 lb of lead could stand considerable paring without any effect whatsoever on the nuclear physics of the problem. Our guess is that the "baby A-bomb" is just the old "daddy A-bomb" with some of the lead taken out.

It is also our guess that the A-bomb, regardless of its size, will remain an air-delivered weapon for many years to come because of the speed and mobility of the method. It hardly seems logical that "atomic artillery" shells would be packed in cases, trucked across hundreds of miles of roads, stored in huge ammunition dumps, stacked beside front-line artillery and loaded by bare-backed artillerymen when a jet fighter could deliver the load on the target in a time measured only in minutes (they cover ten miles per minute, you know).

(*Turn to page* 126, *please*)

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SAFETY ALARM SETS

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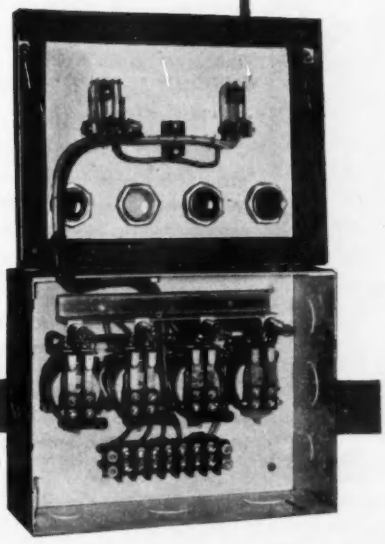

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AN-C-170 (See MIL-C-5541)	

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ALODINE amorphous phosphate coatings provide extra paint permanence and extra durability for aluminum parts and products.

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Brush ALODINE is easily applied in a simple brush-on or flow coat process to large assemblies and surfaces—airplanes, trucks, trailers, boats, housing, building siding, railway cars, bridges, etc.—that are too bulky or too remote to be conveniently treated in tanks or a multi-stage power spray washer. The cleaning and coating chemicals for Brush ALODIZING are shipped in bulk or in the convenient Brush ALODINE Chemical Kit No. 1. This Kit contains enough chemicals to treat about 1,000 square feet of surface and is an ideal package for use at airfields of commercial airlines or of the Armed Services anywhere.

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page* 58)

roller mounted and are locked with a single lock on the top drawer. It has a tow handle for moving the unit from place to place on free rolling swivel-casters, two of which are equipped with brakes. An adjustable light provides illumination for the entire top surface and is connected to a 25-ft extension cord which can be pulled out of a spring-operated take-up reel. Additional receptacles are provided to supply current for a magnifying attachment, monochromatic light, electric comparator, or any other electrical instruments you may wish to use.

F-107—Radiator Cleaner

Now available to protect automotive engines against serious overheating due to faulty cooling systems is the Fram radiator and water cleaner. Recently introduced by Fram Corp., Providence, R. I., the radiator and water cleaner fits cars, trucks, buses and tractors.

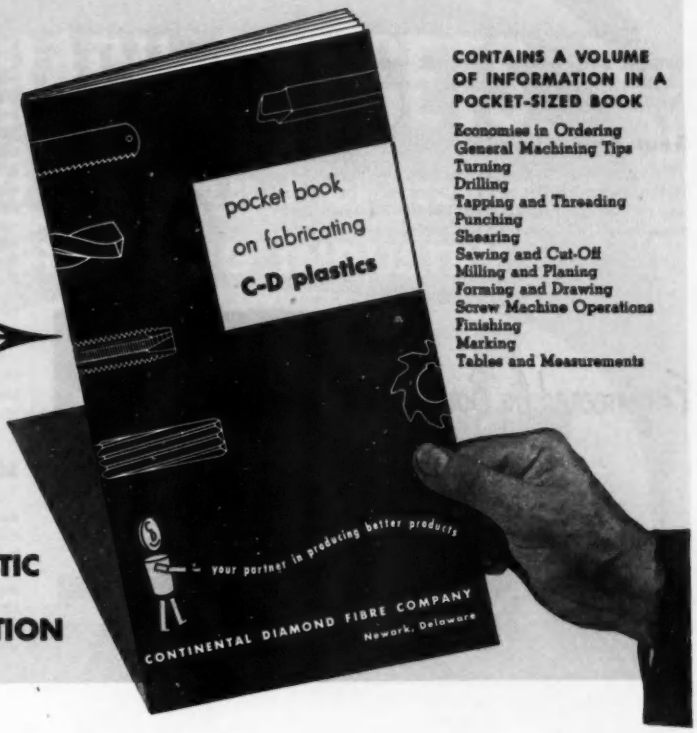
Fram radiator and water cleaner.

The device is said to inhibit rust and corrosion in the cooling system, soften coolant water to stop scale deposits, and filter rust, scale and foreign particles from the coolant.

A controlled amount of water flows continuously from the cooling system and enters the cleaner. Water contacts the softening and inhibiting chemicals in a replaceable cartridge, and passes

(*Turn to page* 72, *please*)

NEW



CONTAINS A VOLUME OF INFORMATION IN A POCKET-SIZED BOOK

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Turning
Drilling
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Sawing and Cut-Off
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Screw Machine Operations
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tells how to

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- ▶ CONSERVE PLASTIC
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This NEW "Pocket Book on Fabricating C-D Plastics" places at your fingertips a wealth of practical, easy-to-use information that can help you conserve plastics . . . speed assembly . . . lower fabrication costs . . . get more production from every man working with plastics.

Written by men who understand your problems, it is filled with valuable tips and suggestions on general rules to follow, tooling recommendations, feeds and speeds. Put to use in your plant, it will help you get the most from every rod, sheet and tube of plastic you use.

Write today for your copy. A note on your company letterhead, giving your title, will bring your free copy of the "Pocket Book on Fabricating C-D Plastics." No obligation, of course.

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DILECTO (Laminated Thermosetting Plastic)
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Established 1895. . Manufacturers of Laminated Plastics since 1911—NEWARK 2 • DELAWARE

News of the Machinery Industries

(*Continued from page* 55)

DUSTRIES, July 1—was presented with a bronze plaque for his long service with the organization.

Gear Production Up

Using 1935-39 as the base period, the AGMA index for September shows volume for the gearing industry to be increased by 11.7 per cent as compared with August. The index figure for September is computed to be 630.1 per cent.

Machine Tool Shipments

According to the latest report from the National Machine Tool Builders Association, shipments of machine tools in September reached the highest levels since early 1944. Although the September index shows an increase over August—189.8 versus 178.0—the climb is not nearly as great as the tool builders would like to show. Once again the problem of material shortages crops up as the blockade to faster machine tool production.

While the shipment index increased slightly, new business dropped off during September—380.2 per cent in comparison with the August index of 488.9 per cent. Foreign orders also hit the skids during September — down 31.7 from August to an index of 27.0. Possibly the foreign index might jump up again during October due to the large scale buying at the Metal Show where prospective purchasers were promised fast deliveries by the foreign builders. One American importer is making delivery on German machine tools in one to three months in many instances.

The NMTBA index of the ratio of unfilled orders to shipments shows a slight gain for September over the previous month—23.6 to one versus 22.8 to one.

Machinery Review

Shipments of selected types of metal working machinery — exclusive of machine tools—amounted to approximately $152 million in 1950, according to the Bureau of the Census, Dept. of Commerce. This represents a decrease of 18 per cent from the 1947 shipments of approximately $185 million for the same types of metalworking machinery. About 86 per cent of the total value of metalworking machinery shipped was accounted for by establishments located in the Middle Atlantic and East North Central States. Ohio ranked first with Illinois, New Jersey, and Connecticut following in that order.

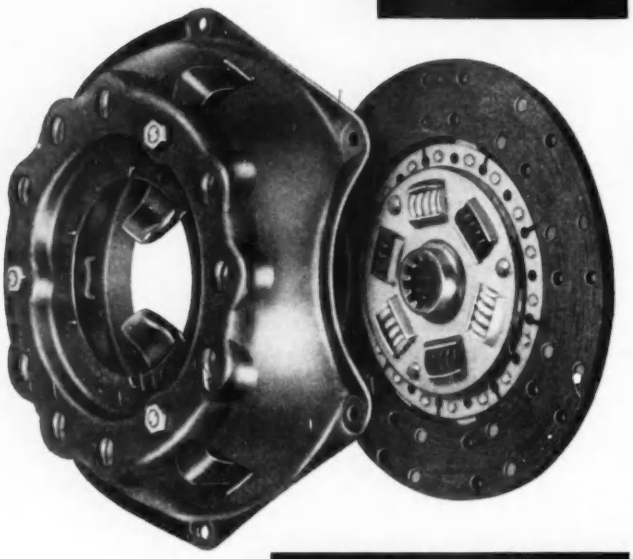
Company Purchased

The Topper Equipment Co., Matawan, N. J., has announced the purchase of Optimus Equipment Co. patents, trademarks, manufacturing rights, sales rights, engineering, drawings, as well as certain inventory and machinery pertaining to the vapor degreasing business. This includes industrial vapor degreasers as well as automotive degreasers sold under the trade name of Circo, formerly manufactured by the Circo Products Co., Cleveland, Ohio.

Thermoid Gets Stock Control of Essex Rubber

The Thermoid Co., Trenton, N. J., has acquired stock control of the Essex Rubber Co., also of Trenton. Thermoid manufactures automotive and industrial rubber, asbestos and textile products. Essex has manufactured rubber soles and heels for shoes and other molded products.

Engineered by Borg & Beck... means MAXIMUM PERFORMANCE MINIMUM MAINTENANCE!



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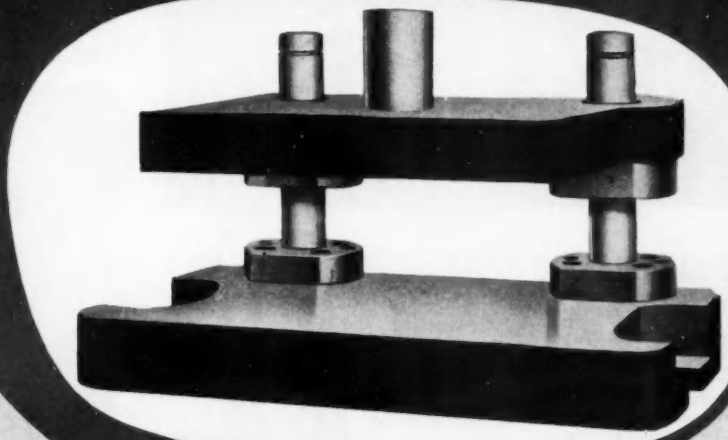

Thank You... Men of the Industry

For your continued use of Baumbach's precision die sets.

We appreciate the opportunity to serve such an important industry with the tools they need to make better products at lower cost.

Because of your acceptance of Baumbach products, we have grown from a modest beginning to the largest exclusive die set manufacturer in the world.

Today Baumbach die sets are available from local stocks in 25 major stamping centers from coast to coast.

Our new catalog showing hundreds of sizes and styles of die sets, plus a complete line of stamping accessories is now ready. Write for your copy today.

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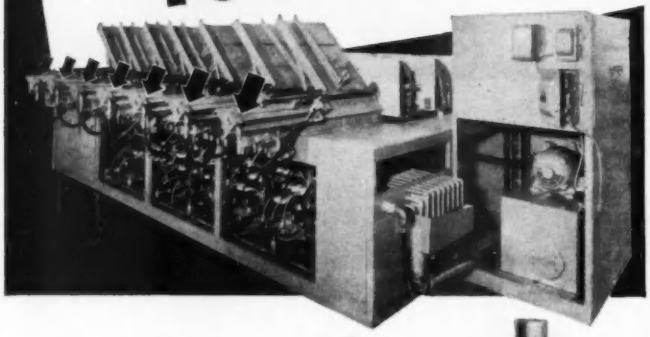
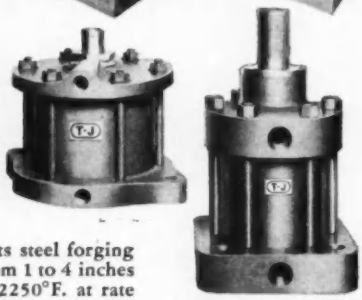
Feeds Automatically WITH T-J CYLINDERS



T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations . . . each with *hydraulically operated billet feeding devices employing T-J Cylinders.* These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor* and *cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles . . . cushioned or non-cushioned . . . 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.



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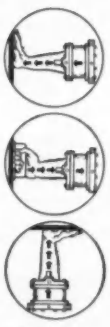


100 LBS. or 50,000 LBS.

35 YEARS EXPERIENCE

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

T-J

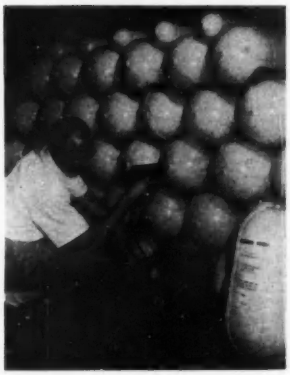
NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page* 68)

through a filtering media where solids are removed. Filtered, softened water containing soluble inhibitor re-enters the cooling system and circulates throughout. The action of the Fram radiator and water cleaner is claimed to be absolutely harmless to antifreeze and other radiator chemicals.

F-108—Leak Detector



For detecting leaks in oxygen tanks and bottles for use on military aircraft General Electric Co., Schenectady, N. Y., has put out its Type H leak detector to search for contaminating halogen vapors, such as chlorine.

By inserting the long, thin probe of the device into the oxygen cylinder it is possible to detect even minute traces—as small as a few parts per million—of halogens which might be deep inside the container, according to the company.

F-109—Analysis Unit

A Norelco fluorescence analysis unit for qualitative and quantitative analysis of constituents in metals, alloys, minerals, ores, chemical mixtures and compounds, is now in production at the Research & Control Instruments Div., North American Philips Co., Inc., Mount Vernon, N. Y.

The fluorescence analysis unit employs a wide range vertical goniometer with a sweep radius of 170 mm. instead of the horizontal assembly used on the original model. It utilizes a horizontal, water-cooled oil-insulated X-ray tube operated from a standard water-cooled Norelco diffraction unit. Output of the volume-sensitive

(*Turn to page* 78, *please*)

If your plant uses machine tools with tableways

YOU CAN'T AFFORD NOT TO READ THESE STATEMENTS

188 metalworking concerns which buy all their other lubricants from our competitors insist on the use of Sunoco Way Lubricant. *They* tell *us* no other refiner has a comparable product.

38 leading machine tool manufacturers approve or specifically recommend the use of Sunoco Way Lubricant on the tableways and slides of their metalworking equipment.

5 different metalworking problems have frequently disappeared as if by magic when Sunoco Way Lubricant was applied. Most such problems, while attributed to other causes, were proved to be the result of the use of an inadequate tableway lubricant. Sunoco Way Lubricant has eliminated trouble supposedly caused by *poor machine tool design* and *deficiencies in hydraulic drives*. Sunoco Way Lubricant also has cleared up *inability to hold close tolerances* and has put an end to *poor finishes* and *scoring of ways*.

Want to see factual case histories and learn more about this product? Send for illustrated booklet, "Sunoco Way Lubricant." Samples are available, too, to companies in the metalworking industry. Write Dept. AA-11.

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in the October 22

LIFE

Chapter III of

"The Second-Most-Interesting Story in the World"

To the average man, perhaps the most interesting story in the world is that of the efforts that science is making to prolong his life, further and further.

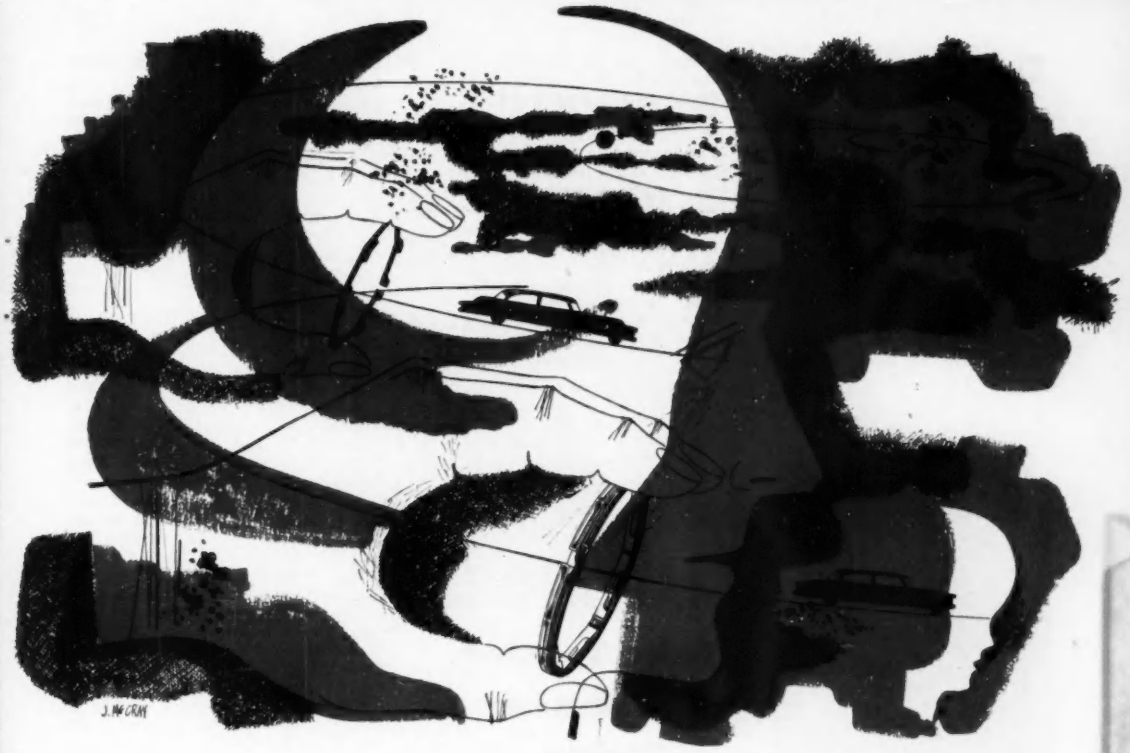
What should be the "second-most-interesting story"—in this motor age—is the effort being made by Automotive Engineers, to prolong further and further, the life of this man or woman's motor car; a service in which Ramsey, with over 60 pioneering patents, is proud to be playing a significant part.

To us, in the Automotive Industry, this is a familiar story; just part of our every day job.

But it is not so familiar to the car owner; and it is to help get the man and woman behind the wheel better acquainted with this "engineering epic", that we are devoting the third installment of the Ramsey Story, reproduced on the opposite page.

In order to obtain as great an audience as possible, we are placing this series in LIFE Magazine. We hope you are following with interest, the successive chapters as they appear, and that you will find them worthy to call to the attention of car owners and car riders—which means practically everybody in America, today.

Ramsey Corporation
St. Louis 8, Missouri
Subsidiary of Thompson Products, Inc.



You can thank RAMSEY ENGINEERING

for the DOUBLE-LIFE PRINCIPLE and 60 other firsts in piston rings

Once 25,000 miles was a record in car life. Today, it is only a beginning!

Just think of this! The piston rings in your car's engine go up and down approximately 6 million times every one thousand miles you drive. That means a lot of wear. Yet your automobile engine is standing up better today than ever before!

And it will stand up even better in the days to come!

The answer is that the Automobile Industry never has relaxed and never will relax its fight against engine wear. Allied with the Automobile Industry for over a quarter-century, in this battle against wear, Ramsey Piston Ring Engineering has made important contributions to the lengthening of engine life of cars, trucks, buses and tractors by

. . studying wear in engines
. . inventing new ways to overcome wear
. . slowing down the rate of wear

The success of Ramsey Engineering in the battle against wear begins over a quarter-century ago, with Ramsey's leadership in the development of the life preserving inner-ring section of the modern piston ring. Since 1931, each of the more than 60 patents granted Ramsey constitutes a further victory against wear.

The Ramsey Double-Life Piston Ring Principle is an outstanding example. Introduced by Ramsey 12 years ago, it has been widely imitated yet it has never been duplicated. *It makes possible the repairing of engines without penalizing them with high piston ring pressures that can increase wear.*

So, whatever the economy of your present operation, you can thank Ramsey Engineering for having had a hand in it. The proof of Ramsey Engineering research and invention is not only in the performance of Ramsey Piston Rings and other products but in their wide imitation and influence on the design of others.

Makers of RAMCO 18-Up Piston Rings, Ramco Inner-Rings, Ramco Piston Skirt Stabilizers, Seal-Tite and Oil-Tyte Piston Rings, Spirolox Retaining Rings, Spiro-Seal Grease Seals and Dust Seals, and special rings for Automotive and Industrial Application. Ramsey Corporation, General Offices St. Louis, Mo., a Subsidiary of Thompson Products, Inc. Factories: St. Louis and Sullivan, Mo.; Fruitport, Mich.; Toronto, Canada.

Ramsey Corporation PISTON RINGS

G5696

SETTING NEW AND HIGHER STANDARDS FOR HARNESSING ENERGY TO MAKE ENGINES AND MACHINES BETTER SERVE AMERICA

Defense Activities at Goodrich

TODAY, in addition to manufacturing rubber products to meet civilian needs, the B. F. Goodrich Co., Akron, Ohio, is taking an important part in the defense mobilization program. Following are some of the company's more important activities.

Latest model military airplanes are employing zippers with rubber lips that seal the slide fasteners against liquids and gases, and provide a complete seal from zero pressure up to the structural strength of the fastener. Made exclusively by B. F. Goodrich, they are called Pressure-Sealing Zippers.

Cold rubber will be used in military tank tracks manufactured by Goodrich. The company is now working on contracts to supply replacement tracks for the Patton, Sherman and Pershing tanks, as well as for high speed cargo carriers and gun motor carriages.

A new "high flotation" tire, now in production, tends to keep military trucks from bogging down in mud or sand. The tire will be standard equipment on U. S. Army trucks, including jeeps. It is said to be better suited for low pressure operation needed for mud and sand service than the World War II general purpose tire.

Small tires, about the size of those used on a Crosley car, cushion the super-fast landings of the U. S. Navy Douglas-built rocket plane which was recently reported to have been flown at the highest speed and altitude ever recorded by any airplane. The landing wheel tires for the world's fastest airplane are capable of withstanding an impact load of eight tons but are only two ft. by 5.5 in. and the nose wheel tire is 20 by 4.4 in.

Tire designs which did a good job on military aircraft only half a dozen years ago are now obsolete. All B. F. Goodrich airplane tires now withstand cold temperatures to –65 F. At that temperature, rubber compounds known early in World War II would break and shatter like glass when undergoing laboratory impact tests.

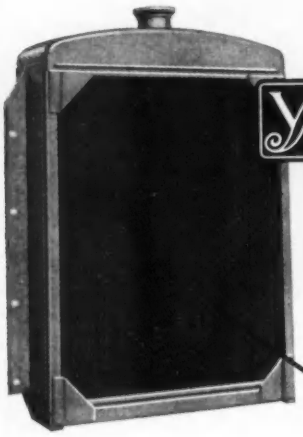
A process which cleans steel cartridge cases 50 per cent faster than conventional methods was recently announced by Goodrich. The cleaning process is one of the important steps in the manufacture of shells for the Ordnance Corps. The new system is the defense version of a continuous process for cleaning and pickling steel, and employs the B. F. Goodrich-Curran automatic spray pickling machine. Equipment needed for the new process is lined with rubber which withstands the highly corrosive action of the pickling acids used.

New bullet-sealing fuel cells Goodrich is making for jet fighters and bombers are one-third lighter in weight than fuel cells used in World War II. Since fuel cells used on some of today's larger military airplanes weigh more than a ton, the new weight savings now possible may be measured in hundreds of pounds.

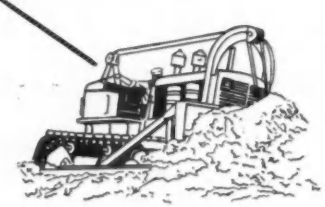
Goodrich has come up with a rubber, mat-like heating pad which can be attached to the leading edge of wings or other surfaces. Small resistance wires are imbedded in the pad and connected with a plug connector to a generator. In operation, the wires heat up and the heat is transmitted to all parts of the surface covered by the pad. Heating pads for airplane exteri- surfaces can be made in any shape or size to fit such parts as antenna masts, propellers, air scoops, spinner domes and cowl rings.

In a normal year, B. F. Goodrich says the rubber supply is divided as follows: Tires take 53.6 per cent; inner tubes, 8.0 per cent; camelback, tire sundries and repair materials, 5.2 per cent; industrial rubber goods, belting, flooring and matting 10 per cent; insulated wire and cable, 3.1 per cent; latex foam, 2.8 per cent; other rubber products, 17.3 per cent.

In 1950, it took over 200 lb of rubber to make the average passenger car. This means about 600,000 tons of rubber went into automobile manufacture last year.



YA RADIATORS
Take Tractor Punishment in Stride



Yates-American makes both stamped and cast-type tractor radiators . . . uses heavy gauge materials to insure trouble-free long life.

Tractors are made for tough duty. Day in, day out . . . on wheels or tracks, they help meet the needs of agriculture and industry in a thousand and one different ways. Service like this calls for radiators with real structural strength as well as efficient cooling characteristics. That's why leading tractor manufacturers rely more and more on Yates-American

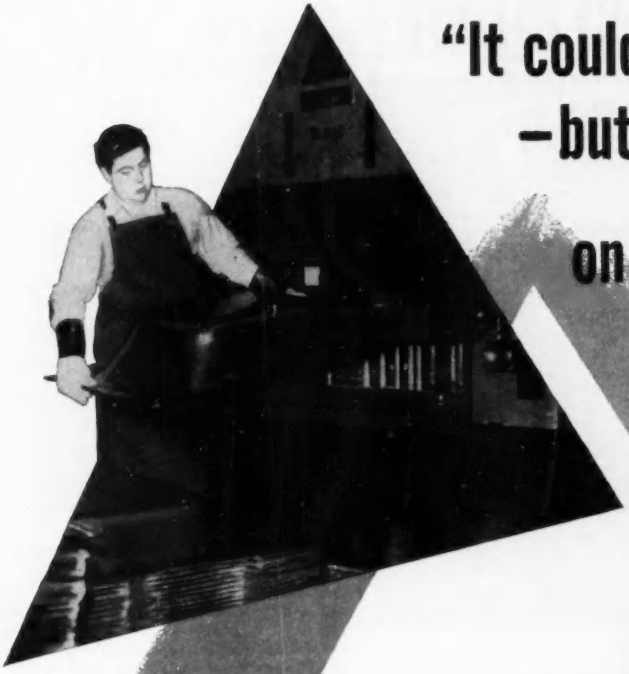
Yes, Yates-American radiators have what it takes to handle the really tough cooling assignments . . . in trucks, locomotives, compressors and power plants, as well as tractors. Yates' engineers insure top results by teaming up in close cooperation with the manufacturer . . . meeting his specifications and helping him give his customers lasting satisfaction.

We'll be glad to tell you more about the advantages of Yates-American heat transfer equipment and how it can help you. Write now for complete information and descriptive literature.

California Representative: E. E. Richter & Son, Emeryville, California

YATES-AMERICAN MACHINE CO.
HEAT TRANSFER PRODUCTS DIVISION • BELOIT, WIS., CHICAGO, ILL.

"It couldn't be done" —but they're doing it on a Clearing



Here is a 225-ton Clearing press drawing seamless trays for strictly modern wheelbarrows in the Kent, Wash., plant of Northwest Metal Products, Inc. The tray is $5\frac{3}{16}$" deep at the back, $7\frac{1}{4}$" deep at the front, $25\frac{1}{4}$" wide and $32\frac{5}{16}$" long. Although it was said this draw could not be made without using special "automobile" steel, they're doing it in a single stroke—using commercial quality steel—on the Clearing in the picture.

Doing the "impossible" calls for men, methods and machines that are out of the ordinary. You can depend on Clearing presses for such jobs because, as so many top production men are well aware, Clearings aren't ordinary presses. We'll be glad to supply evidence of that fact at your request.

CLEARING MACHINE CORPORATION

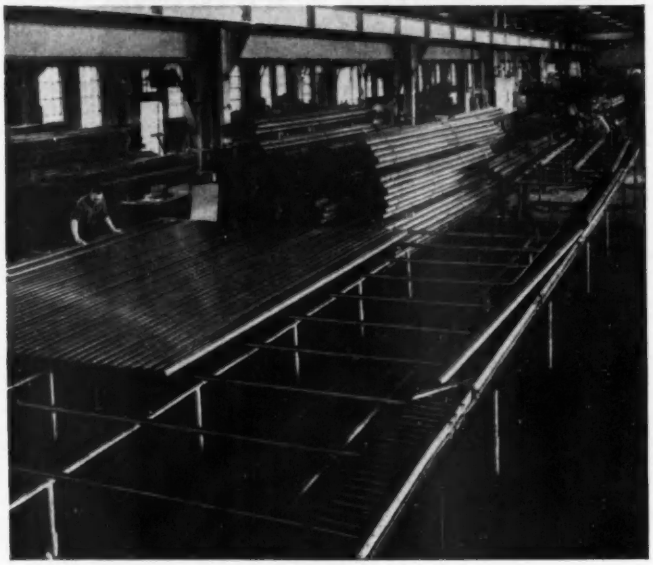
6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS

CMC CLEARING

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

AVAILABLE FOR FAST DELIVERY



Brainard ELECTRIC WELDED TUBING

EXPANDED production at Brainard's new tube mill now permits fast deliveries on certain sizes of electric welded mechanical steel tubing. Brainard tubing is supplied straight or fabricated, sizes ½" to 4" O.D.; .025 to .180 gage.

Brainard tubing is a uniform product produced to close tolerances. It has good machining qualities, and finish can be supplied as specified: for chrome plating, painting, etc.

Integrated production facilities permit quality control throughout the manufacturing process—from ore to finished tubing. You can depend on Brainard service for *your* needs. District offices in principal cities throughout the U. S.

EASY TO FABRICATE

Brainard electric-welded tubing can be beaded, expanded, swaged, spun, flanged, upset, grooved, fluted, flattened, tapered, and otherwise formed to meet a wide variety of design requirements.

Brainard also pre-fabricates to your requirements; bending, end expansion or taper, internal or external beading, slotting, fastening, etc. Call on Brainard's tubing specialists to save yourself fabrication time and costs.

WRITE FOR FULL INFORMATION

Brainard STEEL COMPANY
WARREN, OHIO

Brainard Steel Company
Griswold Street, Warren, Ohio

☐ Send catalog listing complete specifications of Brainard Tubing.

☐ Advise availability of following sizes:_____

Your Name_____

Company_____

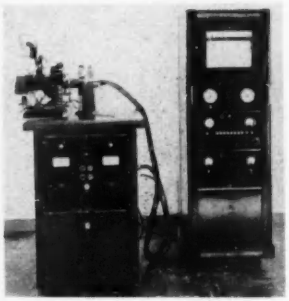
Address_____

City_____ State_____

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page 72*)



Norelco fluorescence analysis unit.

Geiger counter is processed in electronic circuits for the purpose of driving a strip chart recorder or a count register. A chart instrument is used for normal qualitative and quantitative analysis and the register is employed where extreme quantitative precision is required.

F-110—Specific Standard Taps

Specific standard taps have been announced by Detroit Tap and Tool Co., Detroit, Mich.

Under Detroit Tap's new program, specific taps, specifically designed and produced for the tapping of specific materials, are now standardized and carried as regular catalog items.

Thus, in addition to general purpose standard taps—still available for those users desiring to use the same tap for tapping of different materials—the company now offers six lines of specific standard taps. Included in the materials for which Detroit specific standard taps are now available are: steel; cast iron; aluminum, magnesium and other light materials; zinc die casting metals; brass; and plastics.

F-111—Cold Extrusion

A method for cold extruding steel can now be used to form commercial products, according to Mullins Mfg. Corp., Warren, Ohio, which has announced that it is licensing manufacturers to use its process called Koldflo.

The Koldflo process, according to Mullins' announcement, is cold extrusion plus—plus the ability to extrude commercially on available presses and in

(*Turn to page 152, please*)

WE'VE CUT YOUR THREADING COSTS—

On Government Orders Like These

Threading tools, times, and tolerances for a long list of parts included in the current government procurement program are ready for you here at Threading Headquarters—the home of Namco Vers-O-Tools.

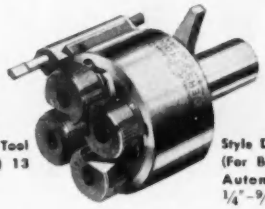
Our engineers have proved these recommendations in production—and our customers are re-proving them in terms of *profit*. They've found that the basic design and construction advantages of the Vers-O-Tool really do pay off.

Take the matter of accuracy: Ground-thread-form circular chasers insure close tolerances and fine finish for the life of the chaser—regrindable through a full 270°. And on some jobs you'll get as many as 100,000 parts between grinds. Direct micrometer check of accuracy after each regrind safeguards sustained production on long runs.

These and many other exclusive Vers-O-Tool features give you a definite competitive edge in bidding on government work. Find out more about them in our catalog D-51. And for specific recommendations on a particular government job, send print or write us direct.

Style DS Vers-O-Tool (Nonrevolving Type) 9 sizes, 3/8"–4 7/8".

Style DR Vers-O-Tool (Revolving Type) 13 sizes, 3/16"–4 7/8".



Style DBS Vers-O-Tool (For Brown & Sharpe Automatics) 3 sizes, 1/4"–9/16".

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Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronoleg • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Aircooled Lightweight Diesel for Aircraft

THE first lightweight, aircooled aircraft Diesel Engine to be designed and built in the United States by Diesel Power, Inc., Pittsburgh, Pa., made its initial bow in a flight test at the Conway-Pittsburgh Airport last month.

The engine took its plane off the ground at an engine-propeller speed of 2600 rpm. At an altitude of 1000 ft the pilot leveled off and circled the airport at an engine cruising speed of 2350 rpm. Kerosene fuel consumption was 4.4 gallons per hour. The fuel used for this initial test was kerosene of 43.0 gravity. It is said that cylinder head temperatures ran as low as 325 F even at cruising speeds.

Taylorcraft plane with tandem seating arrangement used for tests of new aircooled Diesel engine.

Condensed Specifications

Number of cylinders, (opposed)	Four
Bore	4-7/8 in.
Stroke	3-7/8 in.
Horsepower at 2400 rpm	100
Horsepower at 2600 rpm	125
Approximate weight (dry)	245 lb.
Compression ratio	14 to 1
Fuel injection pressure	1200-1500 psi
Fuel injection pump	Bosch 4-A
Injection nozzles, three spray holes	Special
Starter	Combustion
Displacement	290 cu in.

The plane used for this test is a Taylorcraft design built originally to specifications furnished by the Army for a liaison plane, two place with tandem seat arrangement and a dry weight of 1034 lb. The weight of the pilot and fuel added approximately 300 lb.

Aside from the pistons, fuel injection system, and combustion chambers, the engine was designed originally as a gasoline-burning unit for aircraft use. It is claimed that the high peak firing pressures of conventional Diesels are eliminated by the unique design of the new engine.

Pratt & Whitney Production Facilities Enlarged

United Aircraft Corp. has announced the start of construction of a major addition to its Pratt & Whitney Aircraft Div. facilities, East Hartford, Conn. The new building will provide 180,000 sq ft of manufacturing area for the production of jet engine parts.

Stainless Steels
of all analyses

SuVeneer Clad Metals
copper- and nickel-clad steel

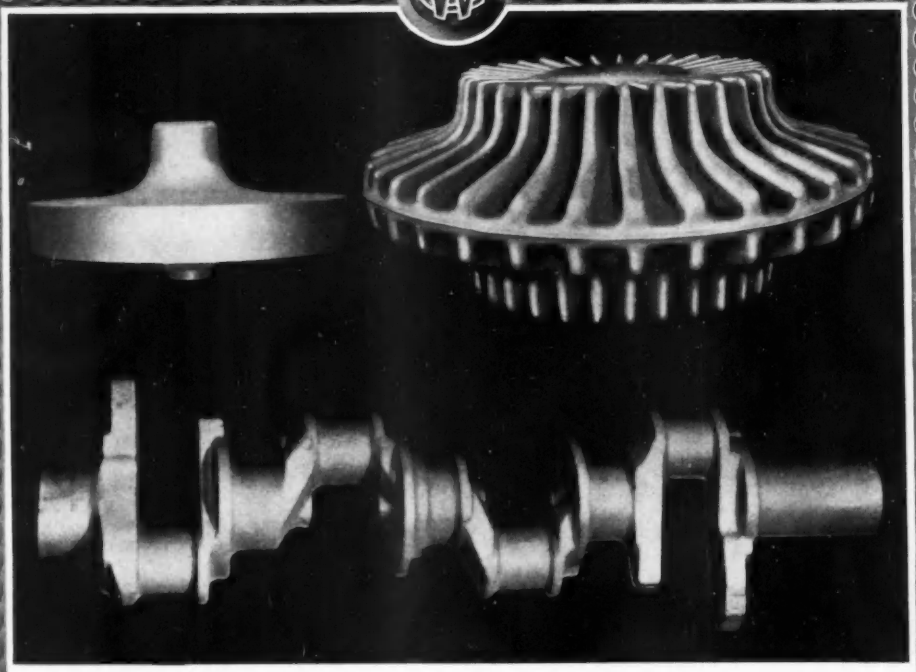
Alloy and Spring Steels
and specialties

the Specialists' name in fine strip steels

Every Superior customer benefits by the fact that our entire manufacturing concern is with quality strip steels. No other product claims a share of our attention . . . all of our experience, research, equipment and methods are concentrated solely on precision strip steel production.

That's why Superior strip behaves properly in your fabricating process—and why you can count upon Superior for consistent quality in performance, coil after coil.

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA



Wyman-Gordon — specialists in the vital forgings of the internal combustion engine since its inception — is today the largest producer of crankshafts for the automotive industry and of all types of forgings for the aircraft industry. Be it crankshafts and other vital forgings for the piston type engines or turbine wheels and impellers for turbo jets — there is no substitute for Wyman-Gordon experience.

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CALENDAR

OF COMING SHOWS AND MEETINGS

American Society of Mechanical Engineers (annual meeting), Atlantic City, N. J. ..... Nov. 25-30

Ninth Annual Pittsburgh Diffraction Conference, Pittsburgh, Pa. .Nov. 29-30

Motor and Equipment Wholesalers Ass'n (Annual Convention) Chicago, Ill. ..... Dec. 3, 4, 5

1952

Brussels Automobile & Truck Show, Brussels, Belgium ..... Jan. 19-20

42nd National Motor Boat Show, New York City ..... Jan. 11-19

Plant Maintenance Show, Phila., Pa. ..... Jan. 14-17

SAE Annual Meeting, Detroit, Mich. ..... Jan. 14-18

Society of Plastics Engineers, Inc. (eighth annual technical conference), Chicago, Ill. ..... Jan. 16-18

Chicago Automobile Show, Chicago, Ill. ..... Feb. 16-24

National Transport Vehicle Show & Fleet Maintenance Exposition, New York ..... Feb. 26-28

Pacific Automotive Show, Los Angeles, Calif. ..... Feb. 28-Mar. 2

Amsterdam Automobile Show, Amsterdam, Netherlands ..Feb. 29-Mar. 10

ASTM Spring Meeting, Cleveland, Ohio ..... Mar. 3-7

SAE Passenger Car, Body and Materials Meetings, Detroit, Mich...Mar. 4-6

Fifth National Plastics Exposition, Phila., Pa. ..... Mar. 11-14

ASTE Industrial Exposition, Chicago, Ill. ..... Mar. 17-21

Geneva Automobile & Truck Show, Geneva, Switzerland ..... Mar. 20-30

American Society of Lubrication Engineers, Seventh Annual Meeting and Lubrication Show, Cleveland, Ohio ..... Apr. 7, 8, 9

SAE Aeronautic Meeting, New York, N. Y. ..... Apr. 21-24

Turin Automobile Show, Turin, Italy ..... Apr. 23-May 4

International Foundry Congress and Show, Atlantic City, N. J.....May 1-7

API Div. of Refining, San Francisco, Calif. ..... May 12-15

American Society for Quality Control (sixth annual meeting), Syracuse, N. Y. ..... May 22-24

SAE Summer Meeting, Atlantic City, N. J. ..... June 1-6

American Society for Testing Materials (annual meeting), New York City ..... June 23-27

SAE West Coast Meeting, San Francisco, Calif. ..... Aug. 11-13

Instrument Society of America (sixth annual meeting), Cleveland, Ohio Sept. 8-12

SAE Tractor Meeting, Milwaukee, Wis. ..... Sept. 9-11

Paris Automobile Show, Paris, France Oct. 2-12

37th International Motor Exhibition, London, England ..... Oct. 15-22

Should you put *your* horsepower to work through some type of *friction clutch*—or some type of *hydraulic drive?* Or a *combination* of both.

Which will make your equipment operate *most efficiently*, at *less cost?* That's one of the tough problems operating men and design men must face today.

And there is only one sure way to find the right answer.

That's to work with application engineers like those you find at the Twin Disc Clutch Company. Men who are trained in applying *all* types of friction clutches and *all* types of industrial fluid drives. Men who are trained to give you an *impartial* recommendation... because no matter what the honest answer may be they can supply the type of connecting link *you should have.*

Yes, for the answer to *your* "which," consult the men who base their answers on the most complete line of industrial clutches and hydraulic drives ... and on the extensive experience of *specialization* for over 30 years.

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CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

Largest Metal Show and Congress

(*Continued from page* 41)

nickel are thus diffusion bonded, all compositions from molybdenum to nickel are formed across the bond. The constitution diagram of the Mo-Ni system, Fig. 1, shows that an intermetallic compound MoNi, exists at the rolling temperature, 2280 F. Thus, this intermetallic compound is formed as a layer between the nickel and molybdenum during rolling. This compound is hard and brittle, and might be expected to be a disadvantageous feature of molybdenum clad with nickel or nickel-base alloys. However, this intermetallic phase in the bond is generally very thin, and its deleterious effect is minimized. For material rolled at 2280 F, the MoNi layer was found to be less than 0.0005 in. thick. The brittle compound layer occupies so small a portion of the cross section that the bending stresses set up in it during normal handling and processing are insufficient to cause rupture.

The nominal stress-strain curves for molybdenum and for "A" nickel are given in Fig. 2. Nickel yields at a very much lower stress than does molybdenum. Thus, by applying a sufficient stress on a composite, molybdenum can remain in the elastic region, while nickel is plastically deformed. This factor, coupled with the lower strength of nickel, indicates why the clad products might be expected to show lower strengths than bare molybdenum at room temperature.

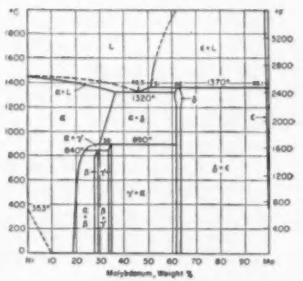

Fig. 1—Phase diagram of the Mo-Ni system.

It would be very difficult to calculate the load carried by each component of a composite over the entire stress-strain curve. The loads may be calculated in the elastic region, however. Here, the molybdenum core carries a higher percentage of the load than its

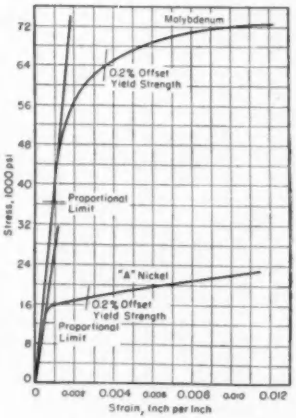

Fig. 2—Nominal stress versus nominal strain for "A" nickel and molybdenum.

AFTER exhaustive and revealing tests have demonstrated the superiority of VULCAN special-purpose diaphragm materials, many of the leading automotive part manufacturers are now switching to VULCAN diaphragms. Wherever diaphragms are used—as in fuel pumps, vacuum booster pumps, dashpot mechanisms and others, these materials excel in performance. They are highly resistant to gasoline, aromatics, oils, alcohols, butane, propane and solvents. They also provide high tensile and burst strength. They insure long life in continuous service. Investigate these new, improved diaphragms. It will pay!

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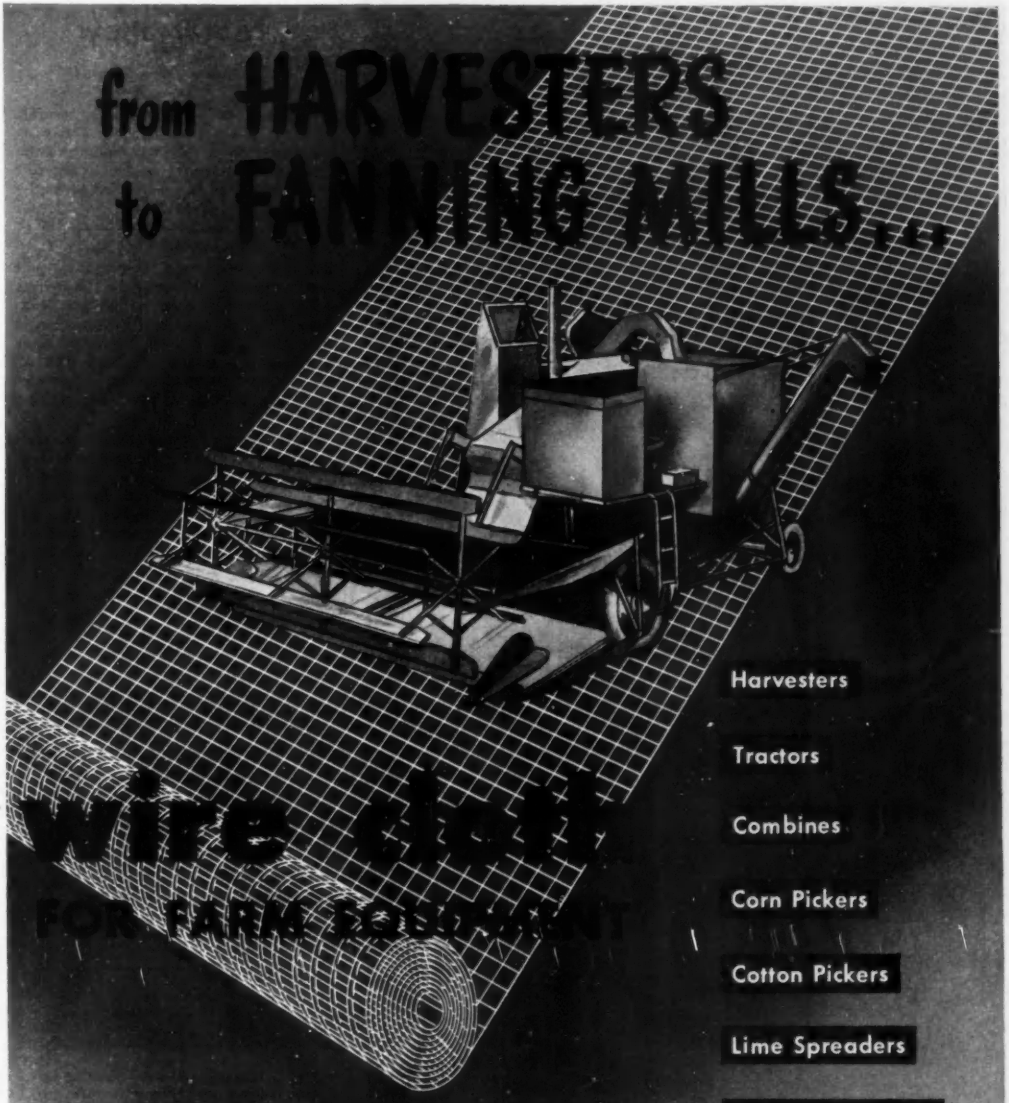

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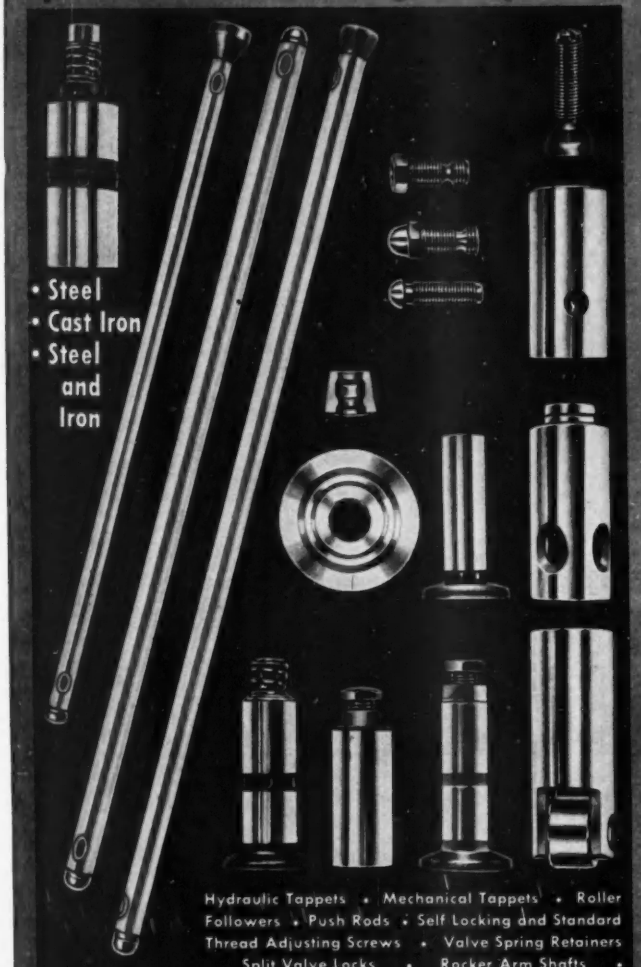
precision valve gear parts



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Special Screw Machine Parts 1/16" to 5" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products.

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

Metal Show

(*Continued from page 84*)

percentage of the total cross section. This is illustrated by the following equation, where M is the cladding fraction and E is the modulus of elasticity:

$$\text{Per cent load carried by the core} = \frac{(1-M)E_{core}}{ME_{cladding} + (1-M)E_{core}}$$

This relationship indicates that the per cent of total load carried by the core is not linearly dependent on per cent cladding. The solution to this equation is plotted in Fig. 3. This curve indicates that the least amount of cladding thickness consistent with oxidation protection would be best for load-carrying properties.

Load-carrying capacities of the two components of the composite in the region of plastic deformation are not so easily calculated. This is particularly true when both cladding and core undergo plastic deformation. However, in service at elevated temperatures,

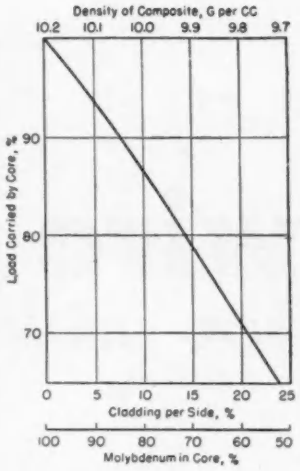


Fig. 3—Density, percent cladding per side, percent molybdenum in core and percent load carried by core in nickel-clad molybdenum.

under stresses above the yield strength of the cladding but below the yield strength of molybdenum, the cladding would be expected to relax under the applied stress so that all the load would be carried by the core.

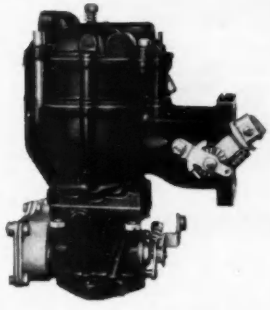
Results of bend-ductility tests on clad molybdenum show that cladding is beneficial in that much more consistent bends could be obtained. Bare molybdenum generally possesses erratic bend properties under the conditions of processing used, such that 0.040-in. sheet

(*Turn to page 90, please*)

Does Your Truck Have Sales Appeal?

IT ALL DEPENDS
ON PERFORMANCE
and
PERFORMANCE
DEPENDS ON

Zenith
CARBURETORS



In the practical field of commercial transportation, product preference is determined solely on performance. Nothing contributes more to the achievement of this desirable end than efficient carburetion. You can be sure that manufacturers whose vehicles are equipped with Zenith, the leader in the field of heavy duty carburetion, have measured carburetion costs in lasting terms rather than initial expense. Zenith's rugged construction, strong idling, freedom from stalling and response to every power demand gives any commercial vehicle added sales appeal. It pays to specify Zenith — the engineers' choice for trouble-free operation.

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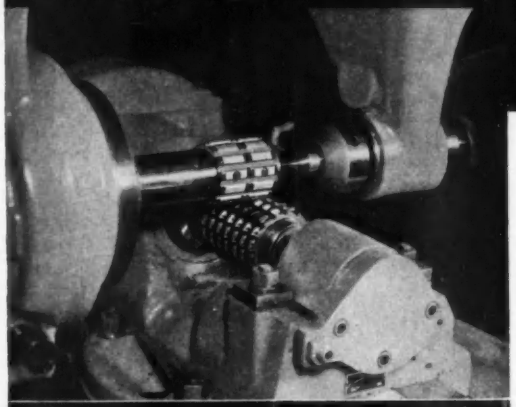
Hob Splined Pulleys with Relative Key Location— Tooth Spacing Assures Accurate Timing



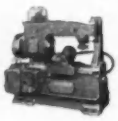
● Straight-sided spline teeth on driving pulleys for industrial sewing machines are hobbed on Barber-Colman No. 16-16 Hobbing Machines as shown in this set-up. Tooth spacing must be held to assure correct timing of the mechanism. Conversion of the job to No. 16-16 Hobbing Machine resulted in a reduction of hobbing time from 9 to 4-1/2 minutes per load of two pulleys. One machine now does the work of 4 previous machines. 3,000 pieces per hob sharpening are obtained using .045" feed per revolution of the work and 137 rpm hob speed.

Change to *Multithread* Hobs Reduces Cutting Time From 26 to 10 Minutes. Adjacent Tooth Spacing Held to .0004"

● Accurate tooth spacing within .0004" adjacent is maintained and hobbing time has been reduced more than half by changing to *Multithread* hobs on this 141-Tooth helical gear job. The accuracy of the No. 16-16 hobbing machine at high production is evident in the lead error per tooth held within .0008" over entire 7/8" face width. Gears are hobbed 2 per load, at .069" feed per revolution and 128 rpm hob speed.

COMPLETE GEAR HOBBING SERVICE

BARBER COLMAN



HOBS • MACHINES • SHARPENING • TECHNICAL DATA

BUILDERS OF PRECISION GEAR

Barber-Colman

CUTS HOBBING TIME IN HALF

● These jobs are typical of the production experience obtained by users of No. 16-16 Hobbing Machines in cutting higher quality gears *with greatly reduced machining time* . . . Recognized for its consistent accuracy under high production operation, the No. 16-16 Hobbing Machine is being used constantly for new and different operations, where precision form limits are required. This splined pulley job is an example. The more conventional intermediate gear operation shows the dependability for producing tooth accuracy at constant high production rates.

Ask your Barber-Colman representative about other new applications, proving similar production advantages.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 1911 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

HOBS AND MACHINES SINCE 1911

(*Continued from page* 86)

either can be bent successfully over a very sharp radius, or will fail on a ¼-in. radius. There are seldom any failures at radii between these two. With clad molybdenum, most of the bends could be made successfully over a sharp radius.

Hard Facing for Impact

By Howard S. Avery
American Brake Shoe Co.

A FEW air hardening steels will be quite strong after exposure to welding heat, but most of the alloy steels will soften during a hard facing operation. The benefit of a hardened steel is thereby lost unless heat treatment after welding is included. This is usually an undesirable complication, though it may be standard practice for critical structural members.

For a simple operation the best base selection is usually an unalloyed carbon steel. The practical range extends from SAE 1020 up to SAE 1095, though welding difficulties increase with carbon content. A favorable base, combining good weldability and strength after welding is SAE 1045 steel. If the steel is clean and well killed, welding difficulties are minimized.

The new ductile irons, characterzied by the easy castability of grey iron, a yield strength range from 45,000 to 80,000 psi, ferritic, pearlitic or austenitic structures as specified, and from five to 20 times the ductility of grey iron, offer attractive possibilities to the engineer designing automotive parts that may be subjected to light or medium impact. Hard facing can protect them from surface wear that would otherwise be too severe.

With design that will cause the hard overlay to be stressed in compression, and that will provide the best practicable support for it, the hard facing alloy may be selected primarily on the basis of the stresses expected. If they are below 150,000 psi and the velocity of impact is below 80 fps it is probable that a martensitic iron will give good service. If the expected stress or velocity exceeds these values, but the impact energy is probably below 400 ft lb, reasonable life with minimum deformation can be expected from martensitic steels. As impact energy exceeds 400 to 500 ft lb it is usually advisable to employ manganese steel.

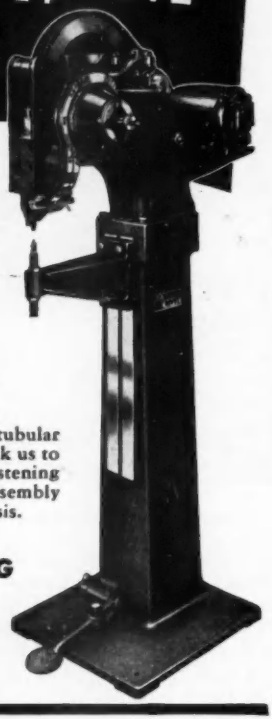
For use in the automotive industries, the hard composite structure of the martensitic irons confers good resistance to abrasion of all kinds, which is primarily the reason for their selection. Moreover, of all the common hard welding alloys, this group appears to have the highest compressive strength and thus promises the elasticity to resist light direct compressive impact blows without damage.

Resistance to erosion or scratching abrasion depends largely on the volume and hardness of the carbide constituent. Thus it is expected to be greater for gas in comparison with arc welds. Depending on the type of alloy and the weld method, the weight loss in test may range from 10 to 30 times lower than soft steel. Test data obtained are believed to reflect chiefly the matrix character of the tungsten carbide deposits, the hard granules being more wear resistant provided they are not lost by undermining. The matrix of tungsten carbide welds is frequently martensitic.

High chromium irons, because their carbides are harder, usually show better erosion resistance than the martensitic irons, but as stress on the abrasive rises, this pattern reverses. This has led to wide use of martensitic irons for general abrasion resistance. Their selection for light impact is much less common but it should be realized that both properties can be had in one alloy.

The elastic compression strength, and consequently resistance to light im-

Chicago RIVET "912"
AUTOMATIC RIVET SETTER
CUTS COSTS 3 WAYS



1 FASTENS FASTER . . .
Only the speed of the operator limits the 912's riveting speed. Completely automatic. A push on the foot pedal automatically feeds, inserts and clinches the rivet.

2 DOES WORK OF SEVERAL MACHINES
Quick change rotary hopper and raceway makes the 912 adjustable in 5 to 10 minutes to set different size rivets. Adjustable anvil height and 12-inch throat provide further versatility.

3 SAVES ON MAINTENANCE . . .
The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.

If your assembly calls for 3/16" steel tubular rivets or smaller, of ¾" lengths or less, ask us to show you how the 912 can cut your fastening costs. Send a sample of your problem assembly (or blueprint) for a free fastening analysis.

FREE CATALOG
contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
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DoALL FRICTION SAW BANDS

Now Available!

DoALL *Friction Saw*

Actual Size 1" Wide 10 Pitch

for all High Speed Band sawing machines 3,000 to 15,000 blade feet per minute

A Better, Longer-life Blade

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Special heat treating process locks the teeth against ripping out

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AVAILABLE FROM STOCK

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SB-1

The Fastest, Cheapest way to cut Ferrous Metal Shapes

HIGH speed friction sawing generates enough heat to soften the metal ahead of the blade — makes possible shape cutting and cut-off work not practical with any other machining method. It cuts many times faster than conventional methods. Use it for cutting thicknesses up to 1". Cut cast irons and carbon, manganese, nickel, chromium, molybdenum, stainless steels and others. Cut a shape from armor plate or cut the gate or riser off a casting.

New DoALL friction saw bands have the teeth locked in by a special heat treating process so that you get longer blade life and lower costs. They are available in ½", ¾" and 1" widths; 10 or 14 pitch; 500 ft. lengths or cut lengths welded to fit your machine. For the ultimate in friction sawing use DoALL saw bands on the DoALL Zephyr Band Machine. Ask for a *free demonstration* at your plant.

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ASK FOR DoALL BAND TOOL MANUAL

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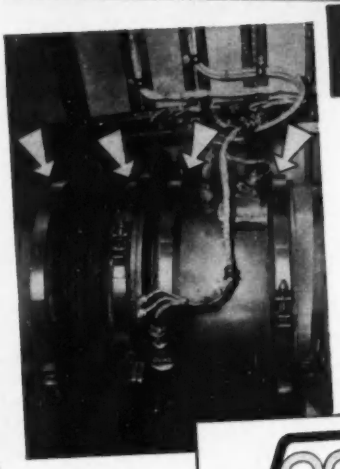
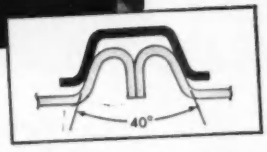
Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

ENGINEERS' NOTEBOOK





V-BAND COUPLINGS

simplify assembly and maintenance

Marman V-Band Couplings connect iris valve and expansion joints of the Douglas C-124 Globemaster II anti-icing and cabin heater. They withstand a temperature range of -65°F to 450°F with an operating pressure of 2.5 p.s.i. Marman sheet metal flanges welded to the ducts provide a quick, economical seal and the quick coupler feature of the coupling latch speeds assembly and disassembly.

Save Cost, Time and Weight with Marman

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STANDARD CLAMPS FOR SPECIAL APPLICATIONS

pact deformation, is very high for the martensitic irons. Ultimate compression strength up to around 400,000 psi can be obtained by heat treating both irons and steels, but in weld deposits, where the desired structural development depends on transformation during air cooling, the irons seem superior.

Armature Quality Improved By Automatic Winding

IT is not often that a revolutionary method finds its way into the manufacture of electrical equipment. Hence the unusual interest in the new procedure recently adopted by the Ypsilanti Plant of Ford Motor Co. for winding of generator armatures. These armatures now are wound automatically in a battery of five machines supplied by the Cleveland Electrical Equipment Co. Illustrations of one of these new machines appeared in the October 1 issue of AUTOMOTIVE INDUSTRIES, page 54.

The change in procedure from conventional hand winding which demands operator skill and dexterity to this automatic machine method was not dictated by direct cost economy entirely. The basic advantage of the technique is found in vastly improved quality. The machine method produces more uniform winding and tension, resulting in superior balance both electrically and dynamically. Thus if the armature core is well balanced initially, its balance will be unaffected by the windings and will require no further correction.

Because of improved winding and controlled tension, as well as elimination of conventional insulation materials, the generator runs cooler than before. There is said to be a gain of about 10 per cent in efficiency, making it safe to draw more current from the same size armature without overheating.

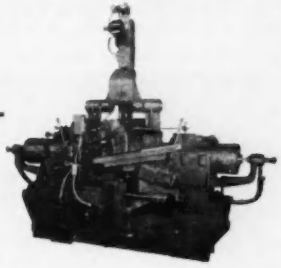
Obviously, the gain in efficiency and the ability of increasing generator rating without any other changes, coupled with the generally higher level of quality, amply justify the adoption of this type of equipment.

At the present time the only function of the operator, apart from keeping the magazine loaded, is to wrap the loose ends of the wires with a rubber band to keep them from spreading. Armature cores are fed to the work station by magazine. As the core drops off the magazine feed, it is automatically chucked in the collet and winding proceeds automatically from that point on. It is hoped eventually that the only hand operation, wrapping loose ends of wires, can be eliminated and when that is done a single operator can readily tend a number of these machines.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

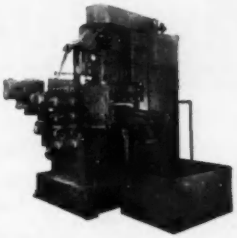
only 3 grinders do the work of 40!

2 Besly Grinders Like This—



No. 926-30" Besly Double Vertical Spindle Grinder

and 1 Like This—



No. 226-30" Besly Double Spindle Wet Grinder

Now Produce As Much as 40 Old-Style Machines—and Do It Better!

• These three new Besly Grinders provide a superior product and more output per man-hour for one of the country's leading piston ring manufacturers. Specific savings include:

1. *A reduced capital investment*—with first cost cut by the sale of the old-style grinders.
2. Operation savings which quickly paid the actual cost.
3. Major economies in power and abrasive and maintenance costs—and;
4. A substantial reduction in job change-over time.

Formerly, it took 40 machines to meet production requirements; today, 3 Besly Grinders do the work . . . and, actually exceed accuracy specifications for finish, parallelism and flatness. Scrap is reduced and the need for 100% inspection eliminated.

If your product requires precision-finished surfaces in quantity, Besly may be able to show you the way to greater production *at lower cost*. A Besly engineer will gladly consult with you without obligation.

JOB PRODUCTION FACTS

No. 226-30" Besly Grinder grinds up to 400 passes per minute on 2¾" diam. x 3/32" rings (keystone material or cast iron). Removes .010" in three passes—holding size from ring to ring within plus or minus .0001 and parallelism within .0001. Then, on the Besly No. 926-30" Piston Ring Finisher, two or three passes, according to requirements, are taken—holding the same close tolerances . . . and grinding 250 passes per minute. Three machines outproduce forty because more stock is removed per pass—at a rate of four times as many passes per minute. Time required for changes from one job to another is reduced sharply for many operations.

NEW ABRASIVE BOOKLET!

Get These Up-to-date Facts on Cost-Saving BESLY-TITAN Wheels.

Just out—this new, valuable data source on the selection and use of modern grinding wheels and discs. Write today for your free copy!

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TAPS—the world's most accurate tap.

TWIST DRILLS AND REAMERS—Complete line for every need.

BESLY-TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job.

GRINDERS that reduce costs on every type of surface grinding

CHARLES H. BESLY & COMPANY

GRINDER DIVISION • BELOIT, WISCONSIN

New Austin Model

(*Continued from page* 35)

will depend upon the allocation of sheet steel and other raw material by the Ministry of Supply. According to an Austin official, the car will not at first feed the famished home market, but will be 100 per cent exported; after that the home market will be met on the proportions of 75 per cent export, 25 per cent home.

Broadly the Austin Seven is a pared-down version of the A-40, with the essential difference that the construction is integral—there being no separate chassis frame. This is a type of construction which has not been so strongly developed in England as in some other European countries. Largely because of this construction, total weight has been reduced to 1460 lb for a sedan having a wheelbase of 78½ in., tread 45 in., overall length 136 in. and height 58 in.

The engine is of the same general design as the larger A-40, with four cylinders of 2.28 by 3 in., giving a piston displacement of 48.8 cu in., and a maximum brake hp of 30 at 4800 rpm. Compression ratioi is 7.2 to 1, and maximum torque 40 lb-ft at 2400 rpm. It incorporated a three-bearing crankshaft with steel-backed babbitt bearings, full pressure lubrication, slightly inclined valves in the head, with a chain-driven camshaft having synthetic rubber chain tensioners, split-skirt Lo-Ex aluminum alloy pistons, with adonized finish, oil seals on the valves, and aluminum intake manifold with stainless steel hot spot. The ignition system is 12 volts.

A Borg & Berg dry clutch of 6¼ in. is used, with a four-speed transmission having synchromesh for second, third and fourth. Unlike the other models, the rear axle is three-quarter floating hypoid type, and the drive is by open shaft with Spicer universals. Final ratio is 5.14 to 1. Independent front suspension by coil springs and rear suspension by semi-elliptics follows the practice on other Austin models. Economies in body construction have been realized by total elimination of the usual soldered joints. Doors consist merely of an inner and an outer pressing without requiring any interior window mouldings. There is no upholstery on the doors, this being simulated by a painted and grained millboard panel held in place by an extruded rubber section.

Daimler has produced an entirely new six-passenger sedan with 183 cu in., six cylinder engine, intended primarily for export, and following the firm's characteristic design features. These comprise a valve-in-head engine developing 90 hp at 4100 rpm, with its highest torque at 1600 rpm, a fluid flywheel, epicyclic pre-selective transmission and hypoid rear axle. While the styling is new, it maintains Daimler conservatism with the full radiator grille, broad curved windshield and rear glass and flowing fenders to avoid any suggestion of flat-sidedness.

Britain having reached the full production stage, changes are nearly all of a minor nature and in most cases hardly justify the designation of new model. Some of them were new only because they were exhibited at Earls Court for the first time. Bentley and Rolls Royce have slightly increased piston displacement. Ferrari showed the 342 American model for the first time. This was the only car in the exhibition with twelve cylinders. Ford (England) showed a convertible Zephyr Six, the top of which was covered with a new washable plastic fabric which folds manually to the "town" position and fully down by hydraulic operation. Other models remain unchanged in main specifications. The Anglia still remains in production, although scheduled to be withdrawn, and is the lowest-priced full-sized car on the British market. It was not on exhibition. Ford was also represented by the Canada

(*Turn to page* 98, *please*)

Highest Precision

HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud *has* to be right—every feature *is*. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown
PRESIDENT

Parts Include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
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Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
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. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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DoALL CONTOUR-MATIC DOES WORK FASTER THAN $35,000 MACHINE TOOL!

DoALL BAND MACHINING ROUGH CUTS ALUMINUM FORGINGS TO SHAPE 50% FASTER, SPEEDS PRODUCTION, RELEASES MILLING MACHINE HOURS FOR OTHER WORK, REDUCES TOOL COSTS.

MIDWEST TOOL COMPANY, Indianapolis, formerly milled aircraft landing gears from 12" x 18" x 24" aluminum forgings. Since purchasing a DoALL MP-20 Contour-Matic, Midwest Tool is getting faster production at lower cost. They now rough cut these forgings to shape on their MP-20, a machine which costs but approximately 1/6 as much as the milling machine and removes the metal many times faster. Only the final machining is now performed on the milling machines. Thus production is stepped-up and the expensive milling machines are freed for other work that only they can do.

In one operation the MP-20 quickly and neatly *slices* the material to rough shape instead of reducing it to a pile of chips — in many cases the material saved can be used for making other parts, etc.

DoALL Contour Band Machining gives you faster, better, less expensive work with lower tool cost. See how this time, money and material saving machine can help you. Ask for a FREE DEMONSTRATION. Call your local DoALL store or write:

THE DoALL COMPANY • 254 N. Laurel Ave. • Des Plaines, Ill.

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Get immediate delivery from local stock on all types and sizes of DoALL Saw Bands. For all band machining DoALL Saw Bands give you longer blade life at lower cost. All are packaged in the handy "strip out" container for safety, convenience and blade protection. There is a DoALL Saw blade for every job.

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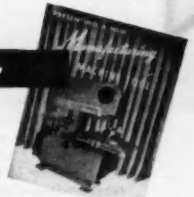
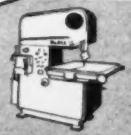


Learn more on how DoALL Contour Sawing can multiply the productivity of your plant. "How to do it" features of the book tell you how to cut costs, increase production and get better work.

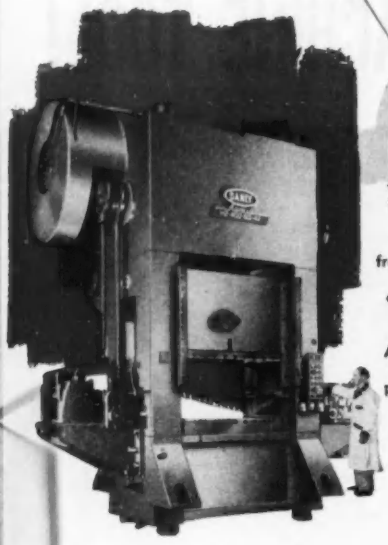
DoALL

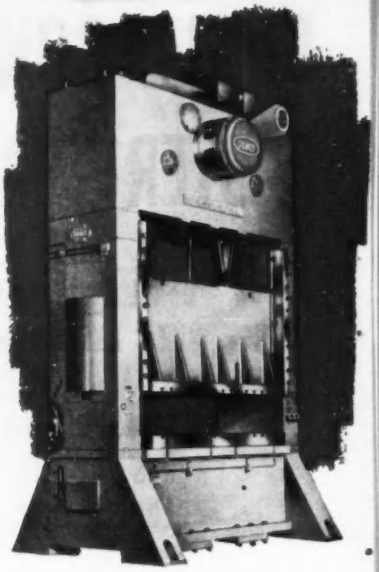
B-6



Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

...to increase output!





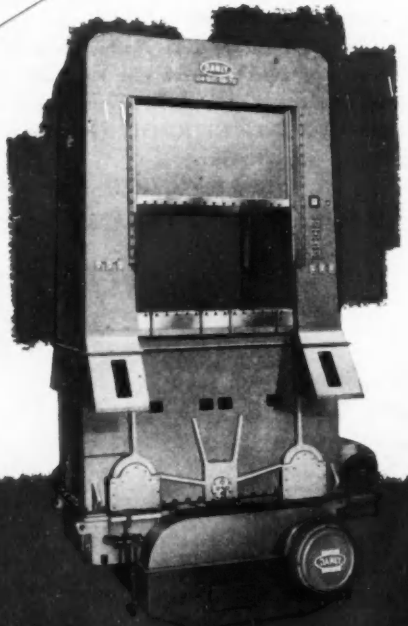
Danly Autofeed Presses feature greater frame rigidity for each rated capacity, reducing vibration and deflection at higher operating speeds. Production of stampings is increased, dies last longer.

Actual production figures* show where Autofeed presses are tripling production using the same dies formerly used on conventional presses of the same tonnage. Likewise, in some instances dies are lasting three times as long between regrinds on Autofeed presses.

Industry's Leaders

DANLY

...to facilitate material handling!



Danly Underdrive Presses, single, double and triple action, are built to clear the working floor for the main function of production. Access required for either major maintenance or service is provided for on a separate subfloor beneath the main working floor.

Many of these presses are being installed in some of this country's most modern stamping plants.* Today, modern trends in automatic material handling are being proved through the dependability of Danly Underdrive Press operation.

...to save manhours!

Danly Single Action Straight Side Presses like this, with automatic lubrication and the exlcusive Danly Cool Running Clutch, are setting new industrial standards for press dependability.

In one leading farm equipment plant* careful shop records indicated average maintenance requirements of only two and one-half hours per week for a 12-month period—and most of that time was consumed in routine press attention!

...to reduce costs!

Danly Double Action Presses are well suited to head up lines producing deep drawn stampings. Features like Danly's Cool Running Clutch offer added dependability so vital in production line operation.

In a large automotive plant* a Danly 500-ton press, single stroking 300 times an hour day and night, has not even required clutch adjustment for lining wear after six months.

Choose PRESSES

DANLY

IT COSTS LESS TO RUN A DANLY PRESS!

You find Danly Presses in the plants that set America's production pace because they're designed and built to increase output and reduce costs at the same time. Unique operating features like the Danly Cool Running Clutch together with extra rigid precision construction and automatic lubrication permit longer uninterrupted production runs—save costly down time.

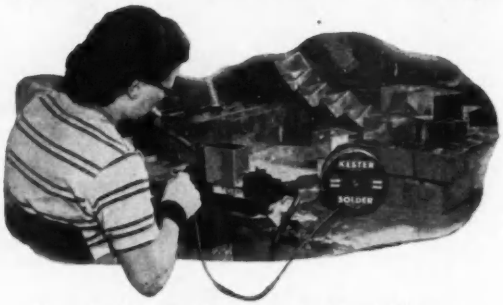
Write today for detailed literature on any of the Danly Press types shown here—or call a Danly press engineer for discussion of your specific stamping problem.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

MECHANICAL PRESSES . . . 50 TO 3000 TONS

Kester Solder



Flame Soldering with Kester "Nosput" flux-core solder. One of Kester's specialized industrial solders that does this job better than any other solder.

No Waste

"Nosput" flux-core solder is only one member of Kester's famous group of flux-core solders. In all there are over 100,000 different types and sizes.

Efficient

Kester can supply the right solder for the job, virtually eliminating waste and rejects. Call in a Kester expert and have him analyze your customers soldering operations.

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Send for free manual: "SOLDER and Soldering Technique"

KESTER SOLDER

Standard for Industry since 1899

Austin Model

(*Continued from page* 94)

plant and by the French products, the latter being the V-eight Vedette and the luxury model built by Facel-Metallon, of Paris.

Jaguar showed a fixed top coupe for the first time, powered by the six-cylinder, two-overhead camshaft XK 120 engine. The firm also has a sports model featuring a tubular chassis frame and torsion bar suspension. Lanchester also showed a drop head coupe on the 122 cu in. "fourteen" chassis, with pushbutton top operation. Renault from France exhibited the 122 cu in. Fregate, which is only just going into production, and Simca displayed the Aronde also just going into production and which bore the tag "not for sale." Standard brought modifications to the "Vanguard" and the Triumph was shown with a limousine body.

Vauxhall, while holding to the same general design, increased wheelbase to 103 in. and widened the tread by three in. at the front and 4½ in. at the rear, to give greater roominess. The engine further forward increases leg room.

Possessing a wider range of types than any other nation, British makers have built up a strong selection of sports cars, embodying Frazer Nash, using a Bristol six-cylinder engine; Aston-Martin with the David Brown engine in a chassis frame built of square section tubes; Jowett Javelin with a flat four in a circular section tubular chassis frame; Jaguar with a 210 cu in., six-cylinder, two-overhead-camshaft engine, the competition model having a special tubular chassis frame. Among the foreign sports cars were the Panhard Sprint with a two-cylinder aircooled flat twin engine, and the Ferrari twelve. Following these purely competition cars there was a wide range of normal models altered for better performance or fitted with a more streamlined body to give them the appearance of sports types.

Aviation engine manufacturers producing cars are Rolls-Royce, Bentley, Armstrong-Siddeley, and Bristol. All three produce high-grade cars. A German car was shown for the first time in England since the war in the Porsche, designed by the late Dr. Porsche, and embodying Volkswagen parts. Special cylinder heads are used to increase output to 40 hp at 4000 rpm. Compression ratio of the 66.27 cu in. engine is 6.5 to 1.

Among the exhibitors was an X-ray Hillman Minx, apparently a standard black sedan, which could be illuminated to show all the internal construction comprising a cut-away engine in operation. A body builder showed a golden limousine on a straight-eight Daimler chassis. Entirely in black, all trimmings were in gold plate with the side

(*Turn to page* 101, *please*)

The Autocar of 1903, one of the infants of the automotive industry, gave no indication of the rugged Autocar trucks to come; and like many another automotive infant, this cute little baby had to learn to creep before walking . . . and that she did, on a 2-cylinder, 10-horsepower motor! Made in Ardmore, Pennsylvania, she carried a price tag of $1750 . . . a small fortune in 1903! Specifications contained in the Autocar catalog of that year stated that the car had three brakes, but no details on this item were revealed.

Excellent color reproduction for framing sent on request. Please use your company letterhead. Supply limited.

RUNS JUST FINE IN RAIN OR SHINE

Many years have slipped away since a quaint little Autocar first invaded the quiet streets of a quiet little community in Pennsylvania, but fond memories linger on.

When we recall that the "rumble" seat was recommended for the use of an attendant, we can visualize a patient soul, seated there in a perpetual nightmare of rain, snow, and biting winds. If he was proud of his bright red coat, he must have wept at the sight of it, following a few months of "sentry duty" on the perch.

Just as his red coat sadly faded, so, too, did the red coat on the car. Color varnishes then available were inadequate and reds were especially vulnerable to weathering.

Today's automotive reds and maroons produced by Rinshed-Mason possess exceptional permanency, which is but one of many reasons why *R-M car colors are used by the manufacturers of today's costliest cars.*

RINSHED-MASON CO. R-M

5935 MILFORD AVE., DETROIT 10, MICH.
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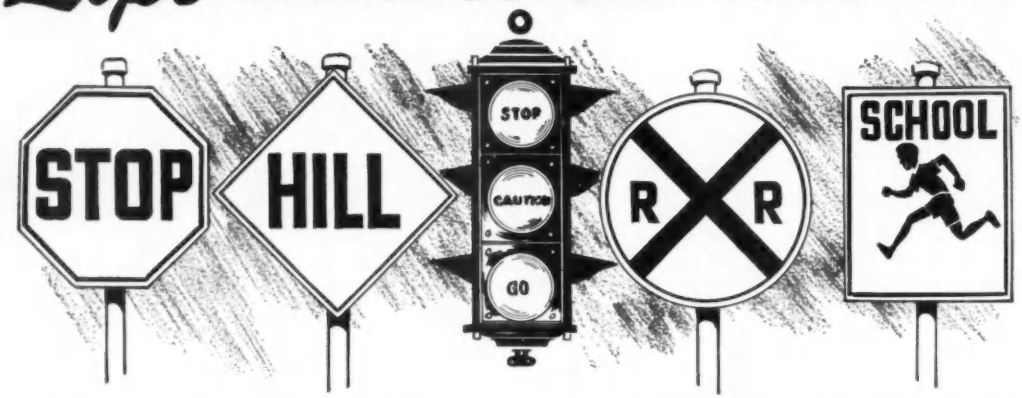
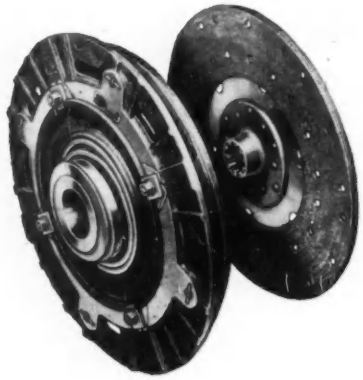
America's leading manufacturer of fine lacquers, enamels and undercoats for automobiles, trucks, farm equipment, appliances, and other products of industry.

Lipe clutches can take it!



SHIFT...SHIFT...and SHIFT AGAIN!

A traffic sign or signal light may mean another —and another—clutch engagement . . . yet the Lipe ML Clutch engages so smoothly there's no grab, shock or jerk.



Perfect engagement like this means less stress on the engine, drive line, axle and rubber—less maintenance—more mileage between teardowns.

Why LIPE Clutches Last Longer . . .

There's only one spring. This acts on 20 levers which press instantly and uniformly on the pressure plate. Friction surfaces are brought together with absolute parallelism. No cocking of the plate—no high spots, no localized burning. Simple shim adjustment maintains this precise engagement over long-time operation.

Write for free Lipe Clutch Service Manual. For quick service on genuine Lipe parts, look for this ad in the yellow pages of the telephone directory in principal cities.

LIPE ROLLWAY

Lipe - ROLLWAY CORPORATION

Manufacturers of Automotive Clutches and Machine Tools

Syracuse 1, N. Y.

Austin Model

(*Continued from page* 98)

panels sprinkled with small gold stars.

Girling showed a hydrastatic disk brake, which apparently has not yet gone into production, but is being tried out by different makers. It is being developed under patents held by the Dunlop Rubber Co. The design consists of a flat metal disk replacing the standard brake drum. Parallel to the axis of the disk, and disposed either side of it, are pairs of hydraulically operated wheel cylinders containing cylindrical lining pads. These cylinders are arranged co-axially to clamp the pads to the brake disk when the brake is applied. Advantages claimed are higher resistance to fade, self adjustment for wear, freedom from distortion, and possible weight reduction.

Public attendance undoubtedly was much below that of the two previous years. The main reasons for this are the realization on the part of buyers that delivery dates are further off than ever; the high cost of cars by reason of the 66 2/3 per cent purchase tax; and the disturbing influence of the approaching general elections. Manufacturers are not happy over present conditions. Permits to purchase steel and other raw materials are granted only by the Ministry of Supply, which thus controls output. If these supplies are withheld production may be decreased to such an extent that costs will rise, particularly among the smaller firms, thus causing increased selling prices which will place their cars beyond the reach of average buyers. While it is believed that there is an immense potential home market, it remains to be seen how many of the present orders will fade away under the pressure of double purchase tax. This situation, however, may not continue with the changes in government that took place in the recent election. Allocations for the home market were this year reduced to 80,000 automobiles. A reduction on this figure is not at all impossible. Another factor which is causing some concern is labor shortage. If the armament program has to be increased, it can be done only by taking workers from the automobile factories.

With competition increasing, the export situation is not as bright as might be desired. During the first eight months of this year the number of passenger cars and commercial vehicles sent abroad was just under 332,400. This was 35,300 less than for the corresponding period of 1950. The value, however, of this smaller export volume was nearly 10 per cent higher because of the greater number of vehicles having a higher unit value, such as public service vehicles, buses and truck chassis. Nevertheless, it is felt that from now on more vigorous competition will have to be met from other automobile manufacturing countries.

NO need to say

"OUR LINE IS DOWN"

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AIRCRAFT • PHILLIPS HEAD SCREWS
HEX HEAD SHEET METAL SCREWS

In All Cold-Heading Materials

Camcar's business is supply!
We do make all kinds of special metal parts, fasteners and screws — of steel, brass, bronze, aluminum, stainless and all cold-heading materials — tested for strength, ductility, non-corrosion and practically all conditions necessary to give you service, cost and quality advantages.
But if you don't have these parts when you need them for assembly, none of these advantages will be important to you.
That's why we say, "Consider Supply First". Hundreds of Camcar Specialists are working every day for this one purpose . . . to keep assembly lines open . . . to demonstrate to you that there's never a need to say, "Our Line Is Down".

When you need Fasteners or Special Parts . . .

Telephone 5-9451 or Teletype RK-53

CAMCAR SCREW & MFG. CORP.

606 Eighteenth Avenue, Rockford, Illinois

"Production-Designed FOR YOUR ASSEMBLY LINE"

West Coast Aircraft Industry

(*Continued from page* 47)

being expanded to handle development work for any type of helicopter jet unit, ranging from small engines for single passenger craft to engines for large size transport and troop-carrying helicopters.

Lockheed

Lockheed Aircraft Corporation's backlog of firm orders and letters of intent of $1.2 billion is one of the largest on the West Coast. This compares with a $200 million backlog in 1948, a six fold increase. Sales for the first six months of 1951 were $98 million (military 89 per cent, commercial 11 per cent), against $125 million for the full year of 1948. Square feet of covered floor area increased from six million in 1948 to 16 million to date. Employment has risen from 16,000 in 1948 to 33,000. Estimated employment by year end will be 40,000.

The size of Lockheed's backlog has accelerated production of its models, and extends some deliveries into 1954. Production models are:

F-94 jet fighters for the Air Force. Production has just begun on the F-94C, a new all-weather fighter version with a more powerful engine, advanced electronic equipment, and redesigned wing and tail for higher performance. The company is tooling up for production of the F-94D, a single seat ground support fighter with a new engine.

T-33 and TO-2 jet trainers. Lockheed is accelerating to production levels on these trainers for the Air Force and the Navy.

P2V patrol bombers. Large numbers of these planes are being built for the Navy and for Great Britain and Australia. The P2V-5, announced this spring, is designed specifically for aerial anti-submarine warfare and carries a nose gun turret, larger fuel capacity, and more electronic equipment.

B-47 jet bombers. In agreement with the Air Force and Boeing Airplane Co., Lockheed reactivated the 5 million sq ft Air Force plant in Marietta, Ga., to build the Boeing-designed jet medium bomber.

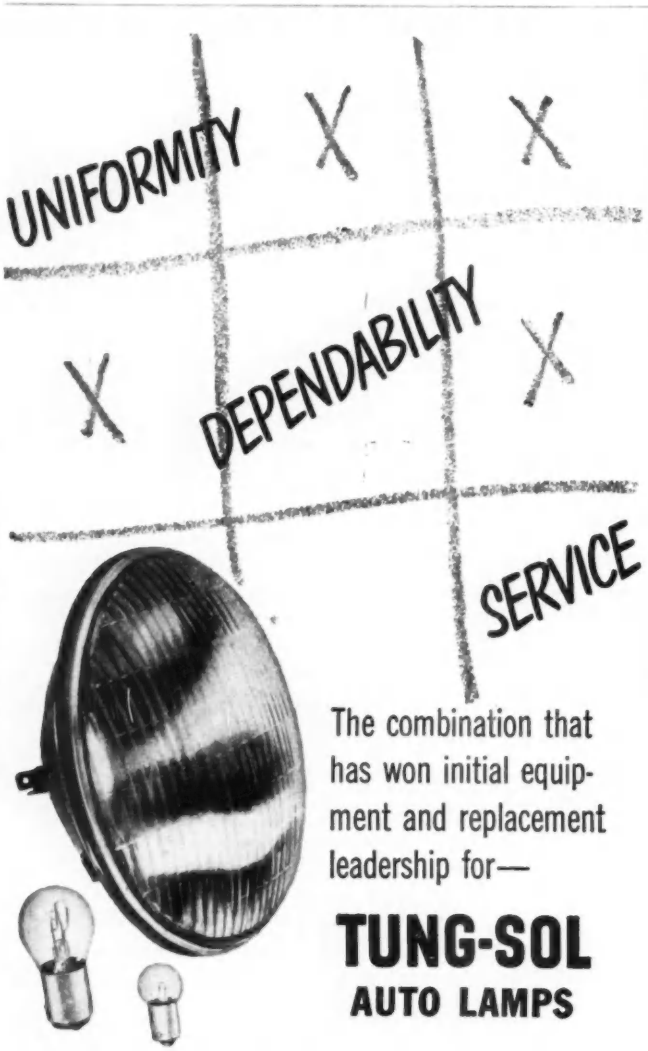
Constellations. Production will continue through 1953. Military orders are for two distinct versions of Model 1049 Super Constellation, R70 and C-121 personnel and cargo transports for the Navy and Air Force, and PO2-W radar command ships for the Navy.

During the past six months Lockheed has won design competitions by the Armed Forces to develop three completely new airplanes. Because of military security, only one of these experimental projects was announced, the XC-130 transport, which the Air Force selected from proposals submitted by several aircraft companies. This plane will have a squat fuselage with an especially rugged floor only 45 in. from the ground. Cargo may be loaded by a ramp at the rear without special freight-handling devices. Four Allison turbo-propeller engines will provide unusual speed for a cargo carrier.

Lockheed is currently constructing a $2.5 million five story engineering building and several smaller structures at the main Burbank, Calif., plant.

With the prospects of a three-fold expansion in its jet flight testing next year, Lockheed has collaborated with the Air Force on a program calling for construction of an Air Force facility at Palmdate, some 50 miles from Burbank, where flight conditions for jet operation appear ideal. The $12.6 million plant will be used for final assembly and test flying of the F-94's and T-33's.

(*Turn to page* 104, *please*)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DEPENDABILITY
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The combination that has won initial equipment and replacement leadership for—
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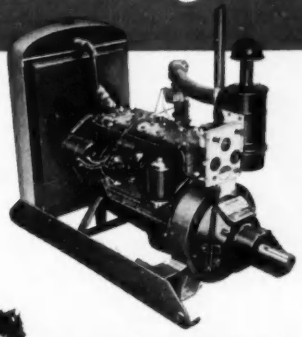
You Profit from FORD POWER in 3 Big Ways!



This Tropic Breeze Wind Machine, made by National Frost Protection Co., Inc., is powered by either two Ford "254" six-cylinder or two "337" eight-cylinder Industrial Engines, depending upon the acreage to be protected.

A BROAD RANGE OF MODELS TO FIT EVERY INDUSTRIAL NEED

• By specifying Ford Industrial Engines and Power Units for your equipment, you can convert power into dollar-and-cents profit in these three important ways:

RIGHT POWER—A choice of five engines in many different models, built for industrial uses, ranging from 120 cu. in. to 337 cu. in. displacement, offer the *right* power with steady, efficient and economical performance for literally hundreds of applications.

RIGHT FEATURES—Each model has all the latest advancements of Ford's famed progressive engineering. A complete line of special Ford equipment, mobile components and accessories is also available to function economically under any operating conditions.

RIGHT SERVICE—No need to carry large inventory for replacements because your nearest Ford Dealer stocks them. This assures efficient, accessible service, too, at all times.

SOME TYPICAL FORD-POWERED DEFENSE APPLICATIONS ARE:
Compressors . . . Pumps . . . Welders . . . Cranes . . . Earth Augers . . . Stone Crushers . . . Generator Sets and many others

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED

Our experienced Sales Engineers are at your service in developing engineering recommendations for the most efficient use of Ford Industrial Power in your application.

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INDUSTRIAL ENGINE DEPARTMENT
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I am interested in Industrial Power for:

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(state your application)

Send me latest literature on Ford Industrial Power (cu. in. displ. and cylinders as shown.)
☐ "120" 4-Cyl. ☐ "226" 6-Cyl. ☐ "239" V-8 ☐ "254" 6-Cyl. ☐ "337" V-8

Firm Name _____
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Attention of _____
Street _____
City _____ *Zone* *State* _____

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THE BEST MACHINE and the finest operator cannot do the best work without that irreplaceable essential — the *right* cutting fluid. Seldom is there more than one cutting fluid that is exactly *right* for the job — with which it may be done faster and better, or both.

Stuart combines theory and practice to give you the right cutting fluid for the job. Here is an example:

In a large gear department, cutting fluid tests were run on Gleason Revacycles cutting 8620 gear stock, 179 Brinnel hardness.

	"X" Oil	Stuart's SPEEDKUT "A"
Gears Per Tool Grind	1200	3200
Stock Removal to Recondition Cutters	.009"	.0035"
Price of Cutting Oil	33c/gal.	35c/gal.

There's a story! More production because of less downtime. Longer cutter life because of fewer grinds and less stock removal per grind. A lower *actual cost* for the cutting fluid.

You can get help like this from a Stuart Representative. Ask to have him call.

Are you receiving Stuart's Shop Notebook regularly? Write, wire or phone

GET MORE PRODUCTION
Use The Right Cutting Fluid

STUART SERVICE
Goes with every Barrel
Offices in Principal Industrial Centers

D. A. Stuart Oil Co.
2733 S. Troy St., Chicago 23, Illinois

Aircraft Industry

(*Continued from page* 102)

North American

North American Aviation, Inc., has doubled its plant area since 1948. Today, it has more than 7 million sq ft in use. This, of course, includes the Government-owned plant formerly occupied by Curtiss-Wright Corp. at Columbus, Ohio. At its main Los Angeles plant, the company makes the F-86D and F-86F Sabres for the Air Force; at Downey, Calif., the T-28 Trainer, AJ-1 Savage, plus the manufacture of electro-mechanical devices, atomic energy and guided missile research and development; at Long Beach, Calif., the RB-45C Tornado, and modification work on the F-86A and T-6G Texan trainers.

The first of several hundred T-6G trainers to be remanufactured at North American's Columbus Division have successfully test flown, and others are beginning to come off the production line there. The program calls for practically complete dismantlement of the planes, inspection and sorting of parts, and then complete rehabilitation of the plane. Worn parts and obsolete equipment are replaced. Instruments and controls are rearranged to fit today's needs for training student pilots.

In addition to the T-6G remanufacturing program, the Columbus Division will also produce Air Force F-86's and Navy AJ-1's and FJ-2's.

Renovation of facilities at the Fresno, Calif., Air Terminal preparatory to the start of manufacturing operations by North American will be resumed soon. Approximately 130,000 sq ft of covered floor space at the airport will be used by North American for a military aircraft modernization program under contracts with the Air Force.

Employment at the three North American plants in the Los Angeles area is 23,200. The Columbus Division employs 6500, for a total of 29,700 North American employes. Sales for the first six months of 1951 were $74 million as compared with $95 million for the full year of 1948. Backlog to date is $510 million, compared with $380 million in 1948.

The upward trend in engineering activity continued throughout the year as development work was carried forward on ten different models in four general airplane categories, as well as on diversified research projects. Indicative of the extraordinary technical demands in aircraft manufacturing is the fact that total employment in engineering activities has exceeded peak engineering employment of the company during World War II.

North American's aerophysics section has emerged from the theory and component design stage on many of its projects. The expanding aerophysics

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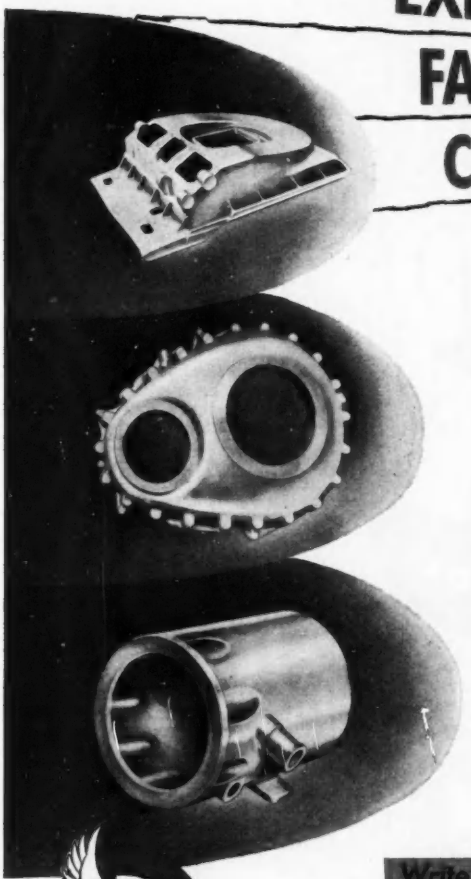
your Aluminum Castings supplier must have

EXPERIENCE
FACILITIES
CAPACITY



These three essentials to reliable service protect you when you select Aluminum Industries, Inc., as your supplier of aluminum castings.

EXPERIENCE — Over 30 years of experience in working with aluminum and its alloys are behind the skill and "know how" of our metallurgists, engineers and foundry personnel.

FACILITIES— In each and every department, from the physical and metallurgical laboratories clear through to the finishing department, the most modern equipment is employed for precision processing, and to control quality at every step of production.

CAPACITY— You'll avoid delivery worries, too. With one of the largest aluminum foundries in the United States for the production of Permanent Mold, Semi-Permanent Mold and Sand Castings (monthly capacity over 2,500,000 lbs. of castings), you can depend upon Aluminum Industries to deliver your aluminum castings when you need them.

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This new Bulletin illustrates and describes our complete facilities for serving your aluminum castings requirements. Recommendations and estimates given without obligation.

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CINCINNATI 25, OHIO

ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS...HARDENED, GROUND and FORGED STEEL PARTS

West Coast Aircraft Industry

(*Continued from page* 104)

activity is devoted to the development of large guided missiles of the ground-to-ground type, to the development of automatic flight and fire control systems for aircraft, and to various other advanced technical projects.

Although much of this development work falls under military security regulations, it has been disclosed that successful static firing tests have been conducted with large rocket power plants designed for use in missiles.

Marking the first entry of the company into the ordnance field, the aerophysics department is now engaged under Air Force contracts in the development and production of a liquid-fuel aircraft rocket.

Northrop

U. S. Air Force requirements for stepped-up production of the Northrop Scorpion F-89 all-weather interceptors has brought steady expansion of all phases of operations by Northrop Aircraft, Inc., Hawthorne, Calif.

Employment currently is at an all time high, 12,500 workers. Northrop is one of the few aircraft manufacturers now employing more persons than were employed in World War II. The World War II peak was slightly above 10,000. Approximately 5000 technicians, engineers, and office personnel have been added to the Northrop payroll since July, 1950, when there were 7500 employed. In July, 1948, employment was 5100.

Northrop had slightly more than 1,100,000 sq ft of covered area in June, 1948. Today the company has more than 1,500,000 sq ft of covered area in use, with building expansion programs in progress that will raise this total to about 2,250,000 sq ft. The current building expansion programs provide for a 30 per cent increase of plant area in Hawthorne. In addition, the company will occupy under lease a 250,000 sq ft building now under construction at Anaheim, Calif., where optical range finders for use in tanks will be manufactured for U.S. Army Ordnance Corps.

Northrop also operates production flight facilities at Ontario, Calif., where F-89's are prepared for delivery to the U. S. Air Force. The company recently announced the opening of a test base for guided missile activities at Cocoa, Fla. About 300 workers will be employed at this base.

Northrop's backlog currently stands at about $255 million, compared with $96 million in 1948. The current backlog consists largely of orders for the F-89's. Besides its F-89 contracts and range finder program, the company is also engaged in development of guided missiles for the Air Force, manufacture of "Maddida" electronic computers, and other work still classified.

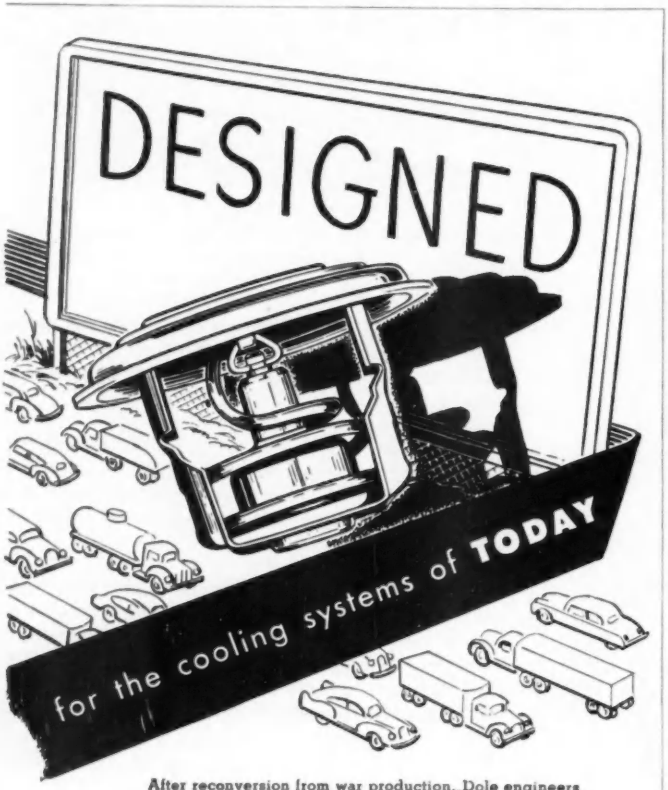
Ryan

Best index of the accelerated pace of the defense effort at Ryan Aeronautical Co., San Diego, is the five-fold increase in backlog of unfilled business from $8 million when the Korean hostilities started, to over $40 million now.

Because of the long "lead time" and months-long job of tooling up for expanded production of aircraft, airframe components and stainless steel parts for jet and piston engines, Ryan's pre-Korean million dollar per month production rate is only now beginning to show the gain in deliveries reflected by the greatly increased backlog.

To provide needed production facilities for expanded manufacture of jet engine components, Ryan has just completed and begun manufacturing operations in a new 75,000 sq ft jet engine parts building. This brings total production space to 730,000 sq ft from the 640,000 square footage figure a year ago.

(*Turn to page* 108, *please*)



After reconversion from war production, Dole engineers designed a completely new Dole Thermostat—announced in 1949—widely used today. This is the first thermostat developed especially to work with the smaller radiators, higher pump pressures and pressure caps used in today's sealed cooling systems . . . Such development work is typical of Dole's cooperation with the industry's design engineers. This is how Dole has long served manufacturers in helping them achieve top performance for their products.

DOLE

CONTROL WITH DOLE

DV Thermostats

THE DOLE VALVE COMPANY
1901-1941 Carroll Ave., Chicago 12, Illinois
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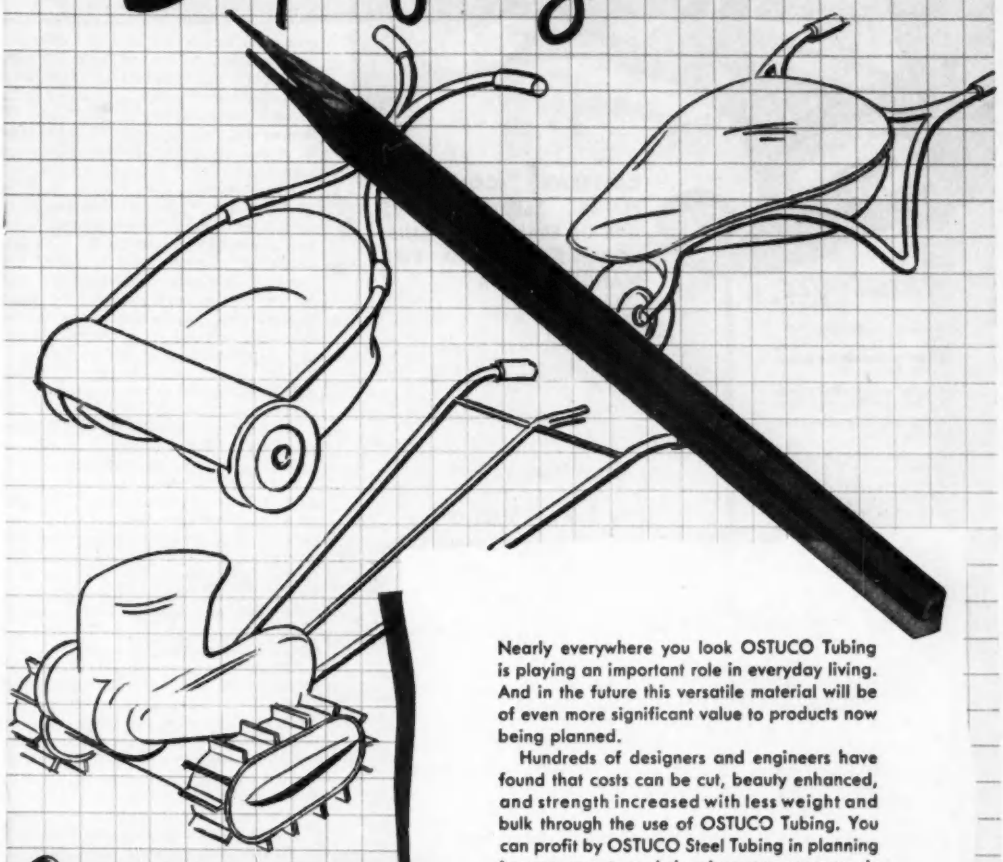
Shape of things to come...



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Nearly everywhere you look OSTUCO Tubing is playing an important role in everyday living. And in the future this versatile material will be of even more significant value to products now being planned.

Hundreds of designers and engineers have found that costs can be cut, beauty enhanced, and strength increased with less weight and bulk through the use of OSTUCO Tubing. You can profit by OSTUCO Steel Tubing in planning improvements and shaping your company's future products.

Because of military demands, we cannot always promise early delivery estimates on new civilian orders. Meanwhile, however, call upon our experienced tubing engineers and take advantage of OSTUCO Steel Tubing in your plans for the future.

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PLUGS to seal off the speedometer hole . . .

to plug up an oblong hole on the manifold assembly.

to slip over the carburetor opening . . .

a masking protector on fuel pumps . . .

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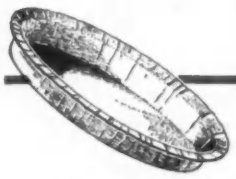

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Aircraft Industry

(*Continued from page* 106)

Reflecting the increased manpower requirements, Ryan employment has doubled from the 1600 on the payroll July 1, 1950, to the more than 3000 now working. Within six months, the employment figure will be above 3500 and is scheduled to exceed this by more than 1000 new workers early in 1952. The number of women workers has increased most rapidly of all, from 250 a year ago to a total of 700 today, and a projected figure of 900 within six months.

Ryan operates two major divisions at San Diego. In the Airplane Division, it has orders from the Government for production on the Ryan XQ-2 jet-propelled pilotless target plane, and research contracts for electronic and jet propulsion development. Its Ryan Navion executive-liaison plane is not currently in production due to 100 per cent concentration on military work.

For other manufacturers, Ryan builds major airframe components including aft fuselage sections and refueling pods for the Boeing C-97 Stratofreighter and KC-97 flying tanker, as well as large external fuel tanks.

Ryan's Metal Products Division specializes in the fabrication of heat- and corrosion-resistant stainless steel components and ceramic coating for the aircraft and aircraft engine industries. Products are made for both jet and piston engines. A ten-fold increase in production of complete rocket motors for surface-to-surface missiles was recently announced.

Exhaust cones, combustion chambers, afterburners, and similar assemblies are built for such jet engines as the General Electric J-47 and the Pratt & Whitney J-57. Ryan exhaust systems for piston engines are used on most of the outstanding multi-engined aircraft now in production.

Sales last year totaled $12.5 million, of which $5 million was accounted for by commercial airplane sales and by exhaust systems for commercial airliners. This compares with 1948 total income of $8 million, of which $3.2 million was for the military services and $4.7 million for commercial use.

In 1950, Ryan produced 250 Navion airplanes for the commercial market, compared with 460 in 1948. Military liaison models of the Navion, designated L-17, have been used in combat operations in Korea. Commercial deliveries were made only during the first four months of 1951 due to the company's present 100 per cent concentration on military work.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

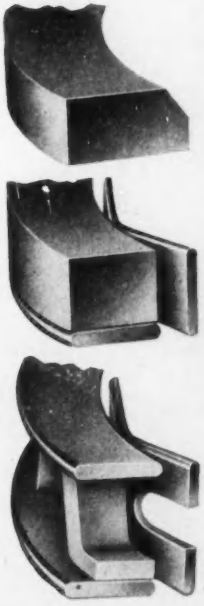
"Made for Each Other!"

SERVICE PISTON RING SETS BY MUSKEGON

Muskegon serves car manufacturers by working with them to design piston rings especially for their engines. By this close collaboration each ring and its companion rings, each set of rings and its corresponding engine are truly "made for each other" and will work smoothly together to produce top performance, mileage, and economy.

Muskegon offers car manufacturers *complete* service—not only design and engineering, but the most modern facilities for the casting, processing, finishing, inspection, and packaging of Service Piston Ring Sets.

These *Factory Approved* and *Factory Engineered* Service Piston Ring Sets are available only through car dealers and other authorized service outlets.



MUSKEGON

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"THE ENGINE BUILDERS' SOURCE"

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CUTTING 20 GAGE and 5/8" PLATE SIDE-BY-SIDE AT ONE STROKE

Photograph shows operators cutting ⅝" plate and 20 gage sheet steel simultaneously on NIAGARA Power Squaring Shear. No change in knife adjustment is necessary.

The ability of Niagara Power Squaring Shears to cut thick and thin plate both at the same time with the same knife setting is a dramatic demonstration. Visitors at our plant can see this done every day. There is no necessity for tinkering with the knife adjustment.

Demonstrates The Sound Engineering Design of

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POWER SQUARING SHEARS

● There is no compromise with sound, proven engineering when it comes to NIAGARA shear design and construction.

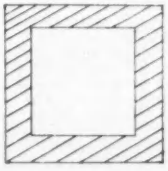
Accurate cutting depends primarily on rigidity of the shear's components.

For bed, crosshead and holddown NIAGARA uses CLOSED BOX SECTIONS to resist with minimum deflection the horizontal, vertical and diagonal or torsional loads to which every shear is subjected.

NO OTHER SECTION WILL DO THIS JOB AS EFFICIENTLY.

Angle or channel shaped sections have long since been abandoned for use on NIAGARA Power Shears.

The economy of quality is remembered long after price is forgotten.



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Defense Contract Awards

This latest list of defense prime contracts that have been awarded covers the period from Sept. 20 to Oct. 18. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, warplanes, automotive components and spare parts, automotive maintenance equipment, etc.

Unit quantities and dollar amounts are given for contracts from $25,000 to $250,000. Contracts above $250 000 are indicated by "over $250,000," but their actual dollar amounts and unit quantities are not available. In some instances the quantity and the dollar value have not been released by the Department of Commerce and this is indicated by the letters "N.F." (not furnished) in this list.

PROGRESS
of a Century

If you should check a list of companies operating in the United States in 1855 — the year of our founding — you would find that very few indeed have been able to survive the economic upheavals of nearly a century. Survival is conditioned upon maintaining high quality standards at all times.

SUPERSTRONG boxes and crates have always enjoyed a reputation for dependability because of their sturdy construction . . . SUPERSTRONG container design has been quick to adapt to changing shipping conditions . . . SUPERSTRONG service is undergoing constant expansion in order to handle customer requirements more quickly and efficiently.

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— A —

Active Gear Co., Chicago, Ill.
Vehicle parts—1150 ea.—$80,500

Aeronautical Machinist, Bridgeport, Conn.
Facilities—$30,000

Aeroproducts Div., General Motors Corp., Dayton, Ohio
Flight test—$99,459

Aero Supply Mfg. Co., Inc., Corry, Pa.
Maintenance parts—var—$54,743

Aircraft Div., Kaiser Metal Products, Inc., Bristol, Pa.
Machinery & equipment—over $250,000

Allen End, Inc., Detroit 7, Mich.
Vehicle parts—over $250,000

Allen Industries Inc., Detroit, Mich.
Vehicle parts—over $250,000

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Tractor—1—$26,902
Repair parts—2845—$35,312
Repair parts—2644—$25,478
Repair parts—3043—$30,058

American Bosch Corp., Springfield, Mass.
Repair parts—24,755—$155,652
Repair parts—32,833—$226,449

American Chain & Cable, Detroit, Mich.
Vehicle parts—2080 ea.—$38,459

American Generator & Armature Co., Chicago, Ill.
Motor vehicle parts—3200 ea.—$205,148

American Locomotive Co., Schenectady, N. Y.
Repair parts—9686—$71,809

American Products Co., Detroit, Mich.
Machinery & equipment—over $250,000

American Stove Co., St. Louis, Mo.
Machinery and equipment—over $250,000

Austin Metal Prod. Inc., Detroit, Mich.
Vehicle parts—3100 ea.—$47,275

— B —

Baldwin-Lima-Hamilton Corp., Lima, Ohio
Spare parts—50 line items—over $250,000

Beech Aircraft Corp., Wichita, Kansas
Generator sets—520 ea.—over $250,000

Bell Aircraft Corp., Buffalo, N. Y.
Facilities—$31,000
Facilities—over $250,000

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.
Misc. assemblies—$100,000
Misc. parts—$100,000

Biederman Motors Corp., Cincinnati, Ohio
Motor vehicle parts—1031 ea.—$62,334
Motor vehicle parts—625 ea.—$41,034

Boeing Airplane Co., Seattle, Wash.
Design study—$197,428

Briggs Mfg. Co., Detroit, Mich.
Machinery & equipment—over $250,000

Buda Co., Harvey, Ill.
Generator set—120 ea.—over $250,000

The Budd Co., Detroit, Mich.
Motor vehicle parts—762 ea.—$38,289

— C —

J. I. Case Co., Racine, Wisconsin
Tractor—33 ea.—$44,100

Caterpillar Tractor Co., Peoria Ill.
Spare parts—var.—$112,975
Spare parts—var.—$98,215

Century Display Mfg. Co., Chicago, Ill.
Tank and combat vehicle parts—1620 ea.—$53,953

Chris-Craft Corp., Algonac, Mich.
Repair parts—4007—$75,057

Chrysler Corp., Detroit, Mich.
Vehicle parts—10,200 ea.—$34,563

(*Turn to page* 114, *please*)

Perhaps we can give YOU a HELPING HAND

● Under present conditions we cannot always give you all the materials you require. But we can give you plenty of help through Revere's Technical Advisory Service. And, our colleagues in American business tell us it's a worthwhile aid, too. We have been rendering this service for many years, and it is backed by a wealth of knowledge accumulated over a century and a half of working with metals.

So, with your problems on the increase, as whose aren't these days, why not check us on what's bothering you and see if we can't help. We are already helping others regarding the usage, to their best advantage, of the products they *can* get.

Since two or more heads can produce more right answers than one, let's get together. You can get in touch with the Revere Technical Advisory Service through the Revere office nearest you.

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How to get grinding wheels exactly suited to his jobs! That's his problem, and he's looking in the best place for the right answer . . . Simonds Abrasive Company's Grinding Wheel data book. It describes Simonds complete line and lists everything *you* need for top grinding efficiency . . . grinding wheels of all sizes, mounted wheels and points, segments and abrasive grain . . . accurately specified and made by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for data book and name of your distributor.

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Contract Awards

(*Continued from page* 112)

Continental Aviation & Engineering Corp., Detroit, Mich.
Spare parts—N.F.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio
Repair parts—363—$56,099
The Corbitt Company, Hendersen, N. C.
Motor vehicle parts—770 ea.—$35,296
Motor vehicle parts—2408 ea.—$25,409
Cummins Engine Co., Inc., Columbus, Ind.
Repair parts—38,560—$136,469
Curtiss Propeller Div., Caldwell, N. J.
Design and fabrication—$43,038
Research work—$29,928
Cutler Metal Products, Camden, N. J.
Tank and combat vehicle parts—200 ea.—$27,160

— D —

Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich.
Generator sets—192 ea.—over $250,000
Diamond T Motor Car Co., Chicago, Ill.
Motor vehicle parts—6496 ea.—$54,757
Motor vehicles—5559 ea.—$28,295
Douglas Aircraft Co., Inc., Tulsa, Okla.
Facilities—over $250,000
Dual Remote Control Co., Garden City, Mich.
Vehicle parts—5000 ea.—$33,933

— E —

Eaton Mfg. Co., Cleveland, Ohio
Machinery & equipment—over $250,000
Eclipse Machine Div., Bendix Aviation Corp., Elmira, N. Y.
Machinery and equipment—over $250,000
Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.
Misc. parts—$35,000
Components — 225 units (approx.) — over $250,000
Elastic Stop Nut Corp. of America, Union, N. J.
Machinery and equipment—over $250,000
Electric Auto-Lite Co., Toledo 1, Ohio
Spare parts—211 line items—$63,028
Electric Storage Battery Corp., Phila., Pa.
Batteries, aircraft—$51,637
Engineering Specialties Co., Inc., New York 7, N. Y.
Repair parts—35—$39,355

— F —

Fairchild Aircraft Div., Fairchild Engine & Airplane Corp., Farmingdale, N. Y.
Design data & components—$197,300
Power plants—over $250,000
Federal Motor Truck Co., Detroit, Mich.
Vehicle parts—1238 ea.—$35,654
Fenn Mfg. Co., Hartford, Conn.
Facilities—over $250,000
Firestone Steel Products Co., Akron 1, Ohio
Hardware—12,250 ea.—$32,869
Firestone Tire & Rubber Co., Akron, Ohio
Recapping aircraft casings—$30,000
Firestone Tire & Rubber Co., Los Angeles, Calif.
Tires—7 line items—$35,356
Tires & tubes—12 line items—$64,856
The Four Wheel Drive Pacific Co., Los Angeles, Calif.
Trucks—1 line item—over $250,000
Frigidaire Division, General Motors Corp., Dayton, Ohio
Machinery & equipment—over $250,000
Fruehauf Trailer Co., Detroit, Mich.
Spare parts—var.—$28,500

(*Turn to page* 116, *please*)

FRAM'S 1st in filtration engineering

Whether your engines are in production or on the drawing board . . . whether they are for civilian or military use . . . whether you want to remove contaminants from oil, air, fuel or water . . . Fram will work with you to design and build filters that meet the exact needs of your engines.

Your guarantee of Fram efficiency and performance comes from constant experimenting, testing and proving in modern Fram laboratories and in Fram's new Dust Tunnel at Dexter, Michigan. All these Fram facilities are available to you for determining the exact filtration requirements of your particular engines.

Fram's top-flight engineering staff, laboratories and nation-wide plant facilities are at your disposal . . . standing ever ready to help you solve your filtration problems.

FRAM CORPORATION, Providence 16, R. I.
In Canada: J. C. Adams Co., Ltd., Toronto, Ontario.

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FRAM OIL & MOTOR CLEANERS • FRAM FILCRON REPLACEMENT CARTRIDGES • FRAM CEL-PAK REPLACEMENT CARTRIDGES • FRAM FILTRONIC REPLACEMENT CARTRIDGES • FRAM CARBURETOR AIR FILTERS • FRAM GASOLINE FILTERS • FRAM CRANKCASE AIR FILTERS • FRAM POSITIVE CRANKCASE VENTILATORS • FRAM RADIATOR & WATER CLEANERS • FRAM FUEL OIL FILTERS • FRAM INDUSTRIAL OIL AND FUEL FILTERS • FRAM SEPARATOR-FILTER FOR IMMISCIBLE LIQUIDS • FRAM CUSTOM-DESIGNED FILTERS FOR SPECIALIZED APPLICATIONS.

(*Continued from page* 114)

— G —

Garland Mfg. Co., Detroit 13, Mich.
Vehicle parts—149 ea.—$42,728

Garrett Corp., Airesearch Mfg. Co., Div., Los Angeles, Calif.
Modified gas turbine—$55,222
Misc. parts—$25,000
Refrigeration turbines—$100,000
Services and material—var.—$50,000

General Electric Co., Burlington, Vt.
Facilities for production—over $250,000

General Electric Co., Johnson City, N. Y.
Facilities for production—over $250,000

General Electric Co., Lynn, Mass.
Machinery & equipment—$65,000

General Electric Co., Schenectady, N. Y.
Ceramic coating—653 ea.—$113,132
Turbosuperchargers—over $250,000

General Electric Co., Washington, D. C.
Generators—over $250,000

General Metals Corp., Enterprise Div., San Francisco, Calif.
Repair parts—3954—$33,749

General Motors Corp., AC Spark Plug Div. Flint, Mich.
Machinery & equipment—over $250,000

General Motors Corp., Buick Motor Division, Flint, Mich.
Machinery & equipment—over $250,000

General Motors Corp., Cleveland Diesel Engine Div., Cleveland, O.
Repair parts—1787—$219,751
Services—over $250,000

General Motors Corp., Electro-Motive Div., La Grange, Ill.
Repair parts—10,169—$47,182

General Motors Corp., United Motors Service Div., Detroit, Mich.
Spare parts—245 line items—$67,544

General Tire & Rubber Co., Akron, Ohio
Recapping aircraft casings—$40,000

B. F. Goodrich Co., Akron, Ohio
Tires & tubes—28 line items—over $250,000
Recapping of aircraft casings—$30,000

The B. F. Goodrich Co., Los Angeles, Cal.
Tires & tubes—$33,441
Tires—7 line items—$136,575

Goodyear Aircraft Corp., Akron, Ohio
Modification of H-5 helicopter—$44,208

Goodyear Tire & Rubber Co., Akron, O.
Retreading aircraft casings—$40,000
Misc. parts—$150,000

The Goodyear Tire & Rubber Co., Inc., Los Angeles 21, Calif.
Tires—100 ea., 1900 ea.—$69,136
Tires & tubes—20 line items—$33,111
Tires & tubes—15 line items—$55,177
Tires & tubes—12 line items—$102,627

Gould-National Battery Inc., Depew, N. Y.
Batteries, aircraft—$25,513

Guide Lamp Div., General Motors Corp., Anderson, Ind.
Lamp assy-head—14 items—$52,767

— H —

Hayes Industries, Inc., Jackson, Mich.
Machinery & equipment—over $250,000

Hercules Motors Corp., Canton 2, Ohio
Repair parts—12,618—$37,979

Holley Carburetor Co., Detroit 4, Mich.
Services & material—var.—$150,000

Homelite Corp., Port Chester, N. Y.
Tanks and combat vehicle parts—700 ea.—$222,075

— J —

Jack & Heintz, Inc., Cleveland, Ohio
Misc. parts—$30,000

— K —

Kaiser Mfg. Corp., Richmond, Calif.
Facilities—over $250,000

The Kefund Co., Inc., Long Island City, N. Y.
Repair parts—817—$82,044

Kenworth Motor Truck Co., Seattle, Wash.
Vehicle parts—3342 ea.—$80,590

Kramer Machine & Eng. Products Co., Waldon, Mich.
Door assy.—2—$71,201

Kropp Forge Co., Chicago, Ill.
Facilities—over $250,000

— L —

Ladish Co., Cudahy, Wis.
Facilities—over $250,000

Lear, Inc., Grand Rapids, Mich.
Misc. parts—$35,000

Le Roi Co., Milwaukee, Wis.
Repair parts—45,042—$42,805

R. G. Le Tourneau, Inc., Peoria, Ill.
Tournacrane—1—$19,340
Spare parts—var.—$82,910

Lockheed Aircraft Corp., Burbank, Calif.
Facilities—over $250,000
Maintenance parts—120 ea.—$119,107
Maintenance parts—149 ea.—$179,252

Lohse Automotive Service, Rock Island, Ill.
Services and material—1401—$60,302

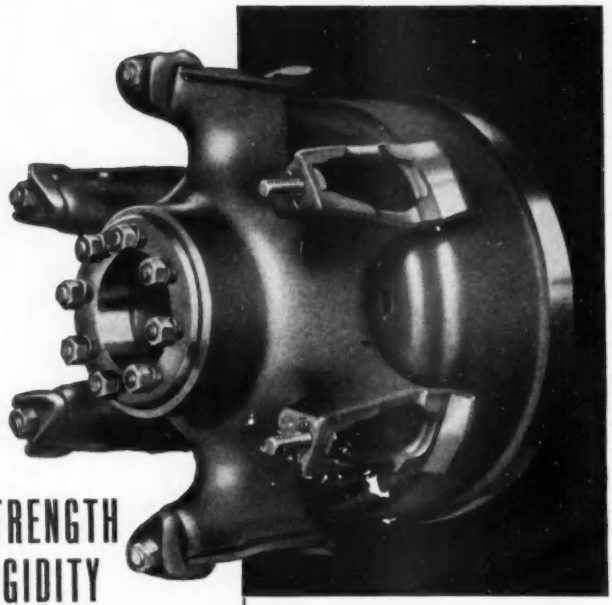
— M —

M-D Parts Mfg. Co., Los Angeles, Calif.
Tank and combat vehicle parts—1000 ea.—$99,600

Madison Muffler Co., Long Island City, N. Y.
Ceramic coat Diesel engine mufflers—97—$56,211

The Maxim Silencer Co., Hartford, Conn.
Repair parts—60—$44,674

(*Turn to page* 119, *please*)



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LIGHT WEIGHT **are characteristics of**

GUNITE

cast-steel wheels
for heavy-duty trucks and trailers

Minimum unsprung weight *and* maximum strength are engineered into all Gunite wheel designs. You get proven strength and rigidity in the Gunite cast electric-steel wheel.

WRITE FOR GUNITE CAST-STEEL WHEEL INFORMATION

GUNITE FOUNDRIES CORPORATION
FOUNDED IN 1854 • ROCKFORD, ILLINOIS

tubing from strip

In one continuous, automatic operation, the AEF Tube Mill converts steel strip into the finest welded tubing. Each mill is a compact, high-speed unit that will produce the highest grade tubing with a minimum of labor, over-head, and capital investment. Over 30 years of successful performance demonstrate that the economy of operation—at ⅛ of one cent per each foot length of tubing—permits the return of the original investment in intervals ranging from 28 days to 6 months. It is impossible to purchase your pipe and tubing requirements to compete with rolling your own on an AEF Tube Mill. Our engineers will plan your installation and give your operators training in operation and procedures. Write us giving the sizes and quantities of tubing needed and the uses for which it is intended. Tubing is guaranteed to be plus or minus .003″ in diameter and concentricity. AEF Tube Mills are manufactured in three sizes, to produce pipe and tubing with wall thicknesses of .025″ to .157″ and outside diameters from ½″ to 4½″ O.D.

AMERICAN ELECTRIC FUSION CORPORATION

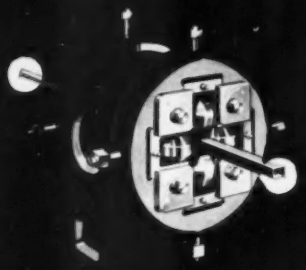
CHICAGO 47, ILLINOIS, U. S. A.

AMERICAN ELECTRIC FUSION CORP.

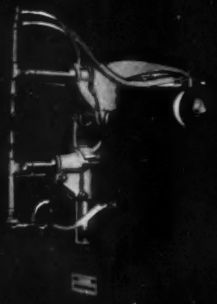
MANUFACTURERS OF ELECTRICAL WELDING EQUIPMENT

2600 DIVERSEY AVENUE — CHICAGO 47, ILLINOIS, U.S.A.

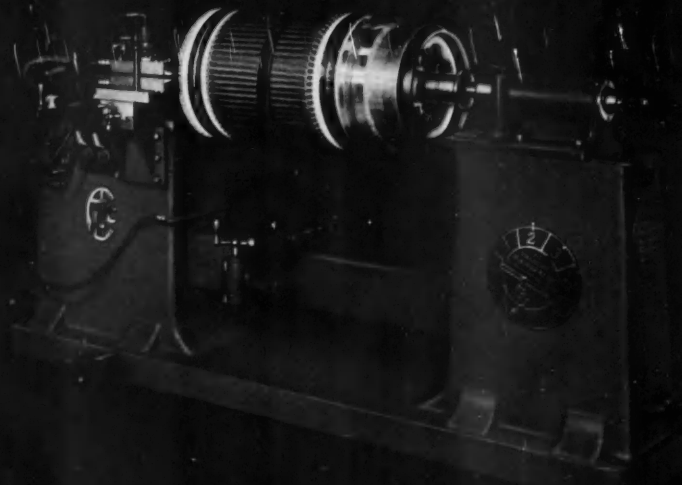
Round tubing produced by AEF Tube Mills can be formed into square, triangular, or other sections with the AEF Turkshead. Operates at Tube Mill speed. Specially formed tubing is cut by a special cutter, interchangeable with the standard AEF Cut-off Unit.



All AEF Spot Welders are designed to permit the maximum adjustment to meet specific individual requirements. They may be operated by manual foot pressure or by automatic air. Each Spot Welder is equipped with the patented "Koldpoint" Electrode Cooling System. The "Koldpoint" increases efficiency and production speed and insures a low cost of operation. It lengthens the life of the welding tips, reduces time and expense of point dressing, and produces more uniform welding. AEF Spot Welders are manufactured in three mechanical size groups and in six transformer capacities.



· QUALITY · MACHINES ·



The CBG - 24 Brazing Machine—developed originally by AEF for a leading Diesel locomotive manufacturer — is built for brazing and silver soldering coil ends of generator and motor armatures. Accommodates armatures of 18″ to 42″ in diameter and can be adapted with slight modification to any diameter requirements. The CBG-24 may also be used as a source of power supply for portable brazing equipment—and for other brazing and soldering applications.

(*Continued from page* 116)

Motor Wheel Corp., Lansing, Mich.
Vehicle parts—over $250,000
Vehicle parts—8036 ea.—$128,576
Mutual Tool & Machine Co., Detroit 3, Mich.
Vehicle parts—800 ea.—$27,920

— N —

National Supply Co., Springfield, Ohio
Repair parts—2155—$52,615
New Departure Div., General Motors Corp., Bristol, Conn.
Machinery and equipment—over $250,000
North American Aviation, Inc., Los Angeles, Calif.
Kits—36—$10,452
Novi Equipment Co., Novi, Michigan
Spare parts—N.F.

— O —

Oliver Corp., Cleveland, Ohio
Range finder—N.F.
Oshkosh Motor Truck, Inc., Oshkosh, Wis.
Snow plow—1 line item—over $250,000

— P —

Pacific Airmotive Corp., Burbank, Calif.
Reconditioning—25 ea.—$100,000
Paramount Rubber Co., Detroit 4, Mich.
Vehicle parts—over $250,000
Piasecki Helicopter Corp., Morton, Pa.
Maintenance parts—4 ea.—$187,771
Precision Aeromotive Corp., Houston, Texas
Overhaul of engines—110 ea.—over $250,000

— R —

Republic Aviation Corp., Farmingdale, Long Island, N. Y.
Kits—$68,719
Aircraft—$40,000
Robinson Aviation, Inc., Teterboro, N. J.
Mounts—115 ea.—$57,210
Rohr Aircraft Corp., Chula Vista, Calif.
Cooling system—$28,397

— S —

Frank G. Schenuit Rubber Co., Baltimore, Md.
Recapping aircraft casings—$30,000
Scintilla Magneto, Div. of Bendix Aviation Corp., Sidney, N. Y.
Maintenance parts—1085 ea.—$30,315
Sikorsky Aircraft, Bridgeport, Conn.
Services and material—var.—$60,000
Spartan Aero Repair, Div. of Spartan Aircraft Co., Camden, N. J.
Rebuild government vehicles—94 ea.—$42,192
Standard Steel Spring Co., Detroit 2, Mich.
Formed rolled armor plates—8 items—$97,238
Sun Shipbuilding & Drydock Co., Chester, Pa.
Repair parts—90—$52,086
Repair parts—30—$26,780
Repair parts—302—$28,866

— T —

Thompson Products, Inc., Cleveland, Ohio
Machinery & equipment—over $250,000
Machinery & equipment—over $250,000
Timken Roller Bearing Co., Canton 6, O.
Spare parts—var.—$25,750
Tube Turns, Inc., Louisville, Ky.
Facilities—over $250,000

— U —

United States Rubber Co., Detroit, Mich.
Recapping aircraft casings—$30,000
(*Turn to page* 122, *please*)

Here's a plastic material for molded parts that will probably always be available . . . with a favorable cost factor . . . no matter what happens. It's a good substitute for castings, die castings, and scarce plastics for many parts.

*ACE-TEX is a black pyrobituminous material that's best known for its use in ordinary auto battery cases. Containing no synthetic plastics or rubber, it has excellent dimensional accuracy, chemical resistance, and smooth finish. It's particularly suitable for box-shaped parts, containers, covers, etc.—even imitation bronze plaques. It can be painted or lacquered. Requires no cure time in molds—just cooling time. Take a look at these properties:

Specific Gravity	1.45-1.55
Tensile Strength, Psi.	1000-1800
Compression Strength, Psi.	4000
Transverse Strength—Modulus of Rupture, Psi.	2000-4000
Hardness at 77°F. Shore "D"	70-75
Coeff. of Expansion inch/Deg. C.	0.00005
Heat Distortion Temp. Deg. F.	135-160
Dielectric Strength, 60 cycles, v/mil	Over 300
Water Absorption	Extremely low; Practically nil.

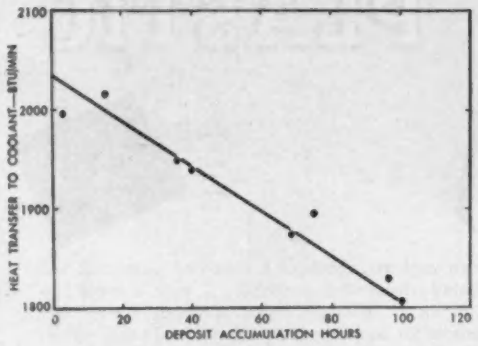
IF YOU HAVE A PRODUCT FACING A MATERIALS SHORTAGE WHERE ACE-TEX MIGHT FIT, SEND US A SAMPLE AND ASK FOR RECOMMENDATIONS.

ACE-TEX is one of many hard rubber, synthetic rubber and other plastics molded, extruded and finished at our two plants. Write for valuable new ACE Handbook of hard rubber and plastics.

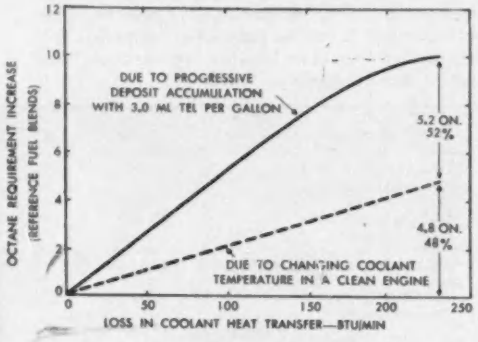
American Hard Rubber Company
93 WORTH STREET • NEW YORK 13, N. Y.

What is the thermal insulating effect

DuPont Petroleum Research



Here we see the effect of deposit accumulation on heat transfer to the coolant. The deposits caused a 230 BTU per minute loss in heat rejection to the coolant.



Comparison of effect on octane requirement of loss in coolant heat transfer resulting from progressive deposit accumulation and due to changing coolant temperature in a clean engine.

When a new engine starts to knock after a few thousand miles of driving, combustion chamber deposits are known to be among the several factors causing this phenomenon.

As an aid to the engineers working on the problem, the Du Pont Petroleum Laboratory recently made a study which included observations on the thermal insulating effect of such deposits and their influence on knock.

Since any factor which upsets the heat balance may also influence the combustion process—and hence affect octane requirement—this possibility was investigated. Could it be that deposits were causing an increase in combustion chamber temperatures? If so, they would upset the heat balance and raise the octane requirement.

As deposit formation progressed in a test engine, the resulting change in heat transferred to the engine coolant was measured. For comparison, the effect on octane requirement in a clean engine was obtained by raising the coolant temperature sufficiently to reduce the transfer from the combustion chamber by an equivalent amount.

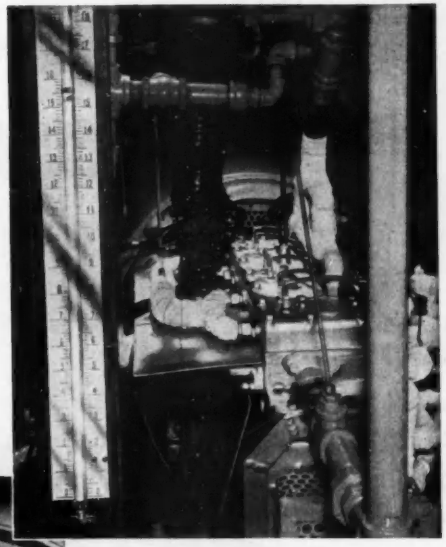
By comparing these measurements, it was found that the heat insulating effect of deposits could account for a major portion of the increase in knocking tendency and the resulting increase in octane requirement.

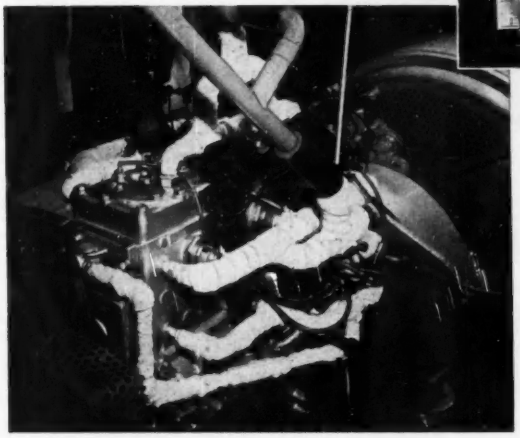
DUPONT SUPPLIES A COMPLETE LINE OF GASOLINE ADDITIVES
Tetraethyl Lead Compounds (Motor Mix—Aviation Mix) • Antioxidants • Metal Deactivator • Dyes

of combustion chamber deposits?

finds an answer

Other findings by Du Pont in connection with this study brought out information on the volume and catalytic effects of deposits on octane requirement. Detailed results of all these studies are available at Wilmington, or through any of the Du Pont Petroleum Chemicals Division district offices. Send for the paper, "Possible Mechanisms By Which Combustion Chamber Deposits Accumulate And Influence Knock"—Serial No. A-2087a.





A standard multi-cylinder engine with special auxiliary equipment for measuring coolant temperature was used for studying thermal insulating effect of engine deposits at the Du Pont Petroleum Laboratory.

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Heat Exchanger Setup Cools Cutting Oil

A RECENT engineering report issued by the Young Radiator Co., Racine, Wis., describes an interesting application of a heat exchanger for cooling cutting oil on a severe metal cutting operation. One of its customers had the problem of machining aluminum bar stock in a 5¼-in. National Acme Gridley chucking machine. At the outset productivity was severely restricted because the cutting oil reached a temperature of 140 F, making it difficult for the operator to handle the work.

It was obvious that steps had to be taken to reduce the temperature of the cutting fluid and the solution was found in the installation of a Young shell and tube type heat exchanger in the coolant circuit. In this instance the customer had available a source of city water having a normal temperature of 56 F. In the interest of conserving water, it was found that by-pass feeding of cutting fluid was entirely satisfactory.

The heat exchanger is set up so that only about 10 per cent of the volume circulated by the coolant pump is forced through the exchanger. A cylindrical 32-mesh screen is installed at the point of delivery into the heat exchanger to trap the larger particles of aluminum chips. However, a large amount of fine aluminum particles find their way into the heat exchanger and tend to load it. To remove this fine material without resorting to dismantling of the heat exchanger, a compressed air fitting has been applied at the top of the vertical pipe which carries oil into the unit. By means of a snap fitting from a shop air hose, the operator is able to flush the system regularly and keep it from clogging.

The present setup maintains a temperature of 97 F for the oil in the sump. The temperature of oil out of the heat exchanger discharge into the sump is 63 F. Temperature of the oil as it comes off the cutting tools now is down to 104 F.

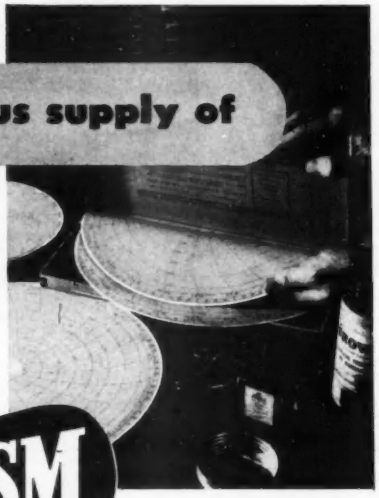
In this setup the actual flow through the heat exchanger is about three gpm. Water consumption is being held to 4.125 gpm.

Order

a continuous supply of

ACCURATE CHARTS

for your Brown Instruments



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HONEYWELL SUPPLIES MAN

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WISE buyers benefit from the provisions of the HSM Plan for all instrument accessories.

In the case of charts, the benefit is two-fold. (1) A continuous supply of charts means greater recording accuracy . . . eliminates the opportunity for damage and shrinkage from humidity changes during long storage of large stocks. (2) Planned and scheduled purchasing, under a blanket agreement, adds convenience and saves money. Both are available to you through your local Honeywell Supplies Man . . . gone are the days of confused specifying and hopeful waiting for delivery. Call in your Honeywell Supplies Man for a discussion of your chart needs and all your instrument accessories . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4548 Wayne Ave., Phila. 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

MINNEAPOLIS
Honeywell
Brown Instruments

Contract Awards

(*Continued from page* 119)

United States Rubber Co., Los Angeles 14, Calif.
Tires and tubes—$27,085
Tires and tubes—$48,470
Tires and tubes—$32,836
Tires and tubes—25 line items—$132,561

— V —

Vancraft Tool & Mfg. Co., Detroit, Mich.
Vehicle parts—2300 ea.—$58,880
Ward LaFrance Truck Corp., Elmira, N. Y.
Motor vehicle parts—450 ea.—$29,721
Motor vehicle parts—5600 ea.—$193,760
Motor vehicle parts—617 ea.—$28,153

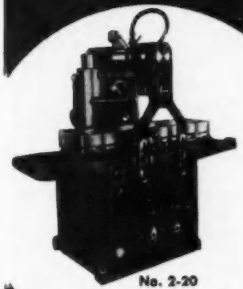
— W —

The Weatherhead Co., Detroit 2, Mich.
Hydraulic fittings—28 items—$121,164
Westinghouse Electric Corp., Dayton, O.
Alternators—1167 ea.—$150,000
Willys-Overland Motors, Inc., Toledo, O.
Facilities—over $250,000
Worcester Gear Wks., Inc., Worcester, Mass.
Tank and combat vehicle parts—$43 ea.—$36,249
Wright Aeronautical Corp., Wood Ridge, N. J.
Services and materials—var.—$200,000

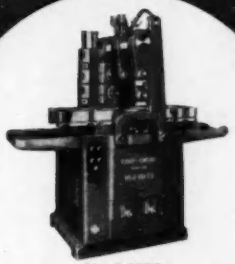
AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

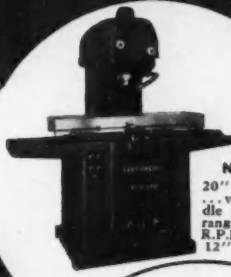
MANUFACTURING



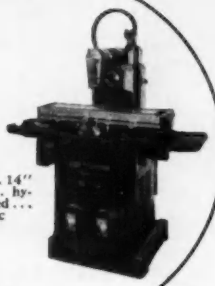
No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.



No. 2-20DS
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.



No. 2-20V
20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Speed up YOUR MILLING!

Get top-speed milling with high accuracy . . . put the work on Kent-Owens Machines! They're outstandingly rugged . . . efficient . . . dependable. Designed with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more . . . save labor . . . reduce costs!* Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.

No. 1-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

KENT-OWENS REPRESENTATIVES

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General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

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Hunter Machine Tool Co.

DAYTON
Geiger Mach'y Company

DETROIT
A. C. Haberkorn Mach'y Co.

FT. WAYNE
Ottis Machinery Co.

GRAND RAPIDS
Joseph Monahan

HAMILTON, ONT.
F. F. Barber Mach'y Company

HARTFORD
Harrington-Wilson-Brown Co.

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Ottis Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Germain Mach'y Co.

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Neff, Kohlbusch & Bissell

MINNEAPOLIS
The Satterlee Company

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John J. Normoyle Co.

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F. F. Barber Mach'y Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Harrington-Wilson-Brown Company

PHILADELPHIA
Calco Machinery Company

PITTSBURGH
Barnes Machinery Company

ROCHESTER
P. W. Schiefer Machinery Co.

SAN FRANCISCO
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Blackman & Noetzel Mach'y Co.
Clarke Equipment Company

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J. F. Owens Mach'y Company

TORONTO, ONT.
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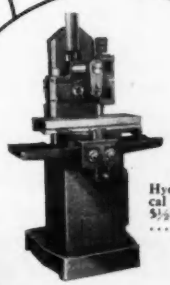
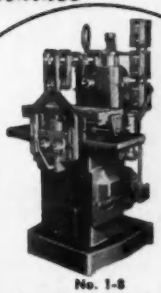
WALKERVILLE, ONT.
F. F. Barber Mach'y Company

No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head-counter-balance.

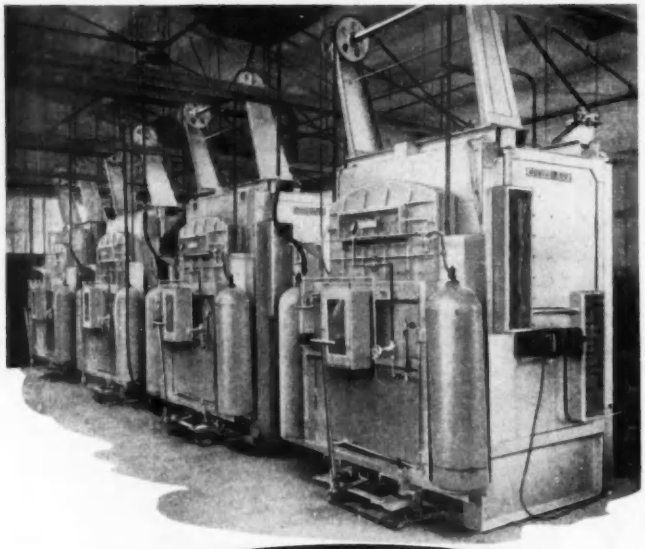
KENT-OWENS
Milling Machines



No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.



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HEVI DUTY CAR BOTTOM NITRIDING FURNACE

Manufacturers producing nitrided parts for aircraft, engines, and heavy machinery items have found that more production is possible at a saving in cost when they use the Hevi Duty Car Bottom Nitriding Furnace. The furnace car, complete with sealed retort and ammonia dissociation equipment can be removed from the furnace for cooling and a second car with a cold load can be inserted immediately for a minimum loss of time between heats.

Write for Bulletin HD-664

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DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

Pegaso Car

(*Continued from page* 34)

lower support arm is the splined ends of two torsion bars. One bar is carried forward and the other to the rear. Front wheel brakes have the same drums as those at the rear, but with air scoops. They have floating shoes with two cylinders. There are two master cylinders, one for the forward brakes and the other for the rear, with a compensator between them.

The steering column is telescopic, with a movement of just over three-in. Steering gear is worm and sector, the sector being on the head of a shaft in a vertical housing, with the horizontal drag link on the base of this shaft. The column passes through the instrument panel.

Body construction is all-steel, electrically welded. The Pegaso has a wheelbase of 92 in. and a track of 52 in. Wire wheels are used with aluminum rims, on which are mounted 5.50 by 16 tires. Instrument panel treatment comprises three large dials, including speedometer and tachometer.

A standard rear axle ratio of 4.36 to one is normally used, but two options are offered—4.18 to one and 4.73 to one. Final gear ratios with the 4.36 to one axle are 13.09 to one in first, 8.5 to one in second, 5.8 to one in third, 4.36 to one in fourth, 3.27 to one in fifth, and 11.84 to one in reverse.

PUBLICATIONS

(*Continued from page* 62)

condensed full-line catalog, B-5164. Equipment for air conditioning, for air handling, and for air cleaning is described in considerable detail.

D-164 Load Cells

Automatic Temperature Control Co., Inc.—Engineering data folders are now available that describe, and illustrate, the application of Atcotran torsion bar load cells and Atcotran cantilever beam load cells.

D-165 Pallet Boxes

General Box Co.—A booklet suggesting three ways that pallet boxes may be used to cut costs in handling, storing, or shipping of material is being offered.

D-166 Marform Process

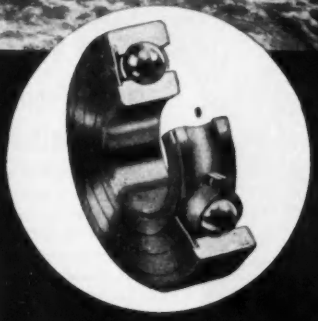
Loewy Construction Co., Inc.—"Better Form With Marform" is the title of an illustrated folder, L-58-619, that is available on the Marform precision deep drawing process.

D-167 Dies

Ajax Mfg. Co.—A 32-page booklet is now available on the design of dies for upsetting forging machines.

Wherever "Specs" call for DEPENDABILITY...

BCA BEARINGS are the standard



The U. S. Army Ordnance Corps' "Eager Beaver" is a truck that has weathered the worst — deep water, mud, heat, cold, dust, steep grades, rocky roads.

Built by Reo to specifications that are really tough, every part of these trucks was selected to withstand the most severe kind of beating. That's why BCA Bearings "or equal" were specified by the Spicer Division of Dana Corp., suppliers of the transmissions and clutches.

BCA Bearings are *performance proved*. They have an enviable record for dependability, economy and long-life ... they are original equipment on many trucks, buses, cars and tractors ... they are the *first choice* of design engineers with critical specifications.

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BCA

BEARINGS COMPANY OF AMERICA

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Makers of a complete line of Ball Bearings for all makes of cars, trucks, buses and tractors.

AIRBRIEFS

(*Continued from page 66*)

Air Mail Pay Separation

After one of the longest and most bitter fights between the Congress and a Federal agency, the Civil Aeronautics Board has at last come right out and shown publicly for the first time the amount of money it pays for the transport of air mail and the remaining amount it pays for direct subsidy. Like all Government doings, however, the result is a hodge-podge of fractions, definitions and "between such and such dates." The CAB established seven different groups of airlines and awarded them mail pay ranging from 45¢ per ton mile for the "Big Four" airlines (American, Eastern, TWA and United) to $7.26 per ton-mile for the "Little Three" (Central, Mid-West and Wiggins). This wide range of pay rates was determined on the basis of "cost of service," which contains such intangibles as length of traffic haul and average distance between stops, density of traffic, volume of operations, type of aircraft, etc.

When all of these things are figured out, the answer is what it costs the airline to carry the mail that it carries. CAB tops this off with a flat eight per cent profit and that produces the rates contained in the new structure. Payments above and beyond this figure are now clearly labeled "subsidy" and sharpen up the target for the railroads, steamship lines and other critics. These payments amounted to $27.4 million for carrying the mail and $34.5 million for subsidy during the 1951 fiscal year. During the current 1952 fiscal year the payments will be $29.6 million for mail pay and $27.7 million for subsidy. During the 1953 fiscal year the payments are expected to be $31.8 million for carrying the mail and $24.1 million for subsidy, a 30 per cent reduction in the latter item over last year.

The theory behind the subsidy is that the CAB forces the airlines to operate into small cities and with frequencies into many larger cities which are unprofitable from the passenger-volume standpoint. This service, in addition to providing air mail for these points, is provided by Government subsidy to the carriers in the "commerce" and "national defense" interest. But CAB insists this subsidy is very small in comparison with the value of the service. In the 13 years of subsidy service, the CAB spent $775 million and the sale of air mail stamps totaled $718 million, or an average subsidy rate of a little over $4.3 million per year.

Supersonic Roller Coaster

While it's true that the "sonic barrier" has been shattered and supersonic flight is now commonplace, latest report from the pilot who has been farthest beyond the barrier indicates there are still aerodynamic mysteries there. Douglas test pilot Bill Bridgeman, who has pushed the rocket-powered D-558-II Skyrocket to twice the speed of sound, reports casually that the plane rolls violently in "level" flight with the wings rocking up to 75 deg angles and the plane sideslips or skids along at an angle of 6½ deg to straight flight. Bridgeman reports that at maximum speed he has rolled the airplane up into a vertical position and pulled back all the way on the elevator (the prescribed method of executing a 180-deg turn) and found that absolutely nothing happened; the airplane continued to fly straight ahead while cocked up on its side. This is the sort of thing that the NACA piloted aircraft research program was designed to uncover but it is indicative of the fact that supersonic flight isn't yet commonplace. But then, of course, these strange things occurred while the Skyrocket was traveling about 1900 ft per *second!*

(*Turn to page 130, please*)

CONTROL POWER BETTER

Clutch Engineering Help
for Transmission Designers
Whether your transmission problem involves a single or double plate or multiple-disc clutch, a power take-off or a speed reducer, the ROCKFORD engineering staff will contribute over a quarter century of successful clutch application experience toward its practical solution. Thousands of design engineers have utilized this help to fit maximum torque with minimum bulk and weight into compact product designs. Just write or phone for this ROCKFORD field engineering service.
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Here's one reason why every rig equipped with a Fuller ROAD RANGER 10-speed Transmission is posting new records for *higher average speeds:*

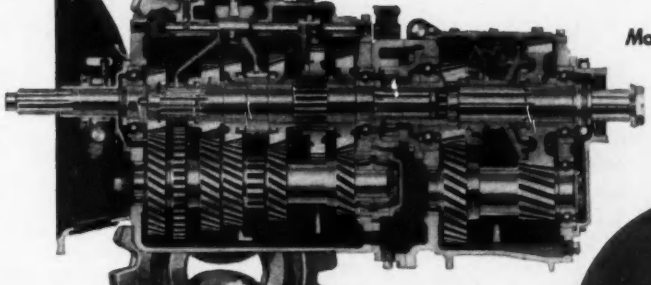
Every link is the same, in *equal, progressive,* and *selective* steps—at the driver's command *without gear-splitting.*

Every shift—up or down—is a 28% step. Every ratio is completely usable. Not one of the 10 forward speeds overlaps the next higher or lower ratio.

With these closely spaced ratios—controlled with *one* lever—it is *easy* for the driver to keep the engine operating in *the* maximum economy range . . . to keep the load rolling faster, for less.

Write today for complete information on the Fuller ROAD RANGER, the 10-speed transmission where every link is the same!

Model R-95-C ROAD RANGER®



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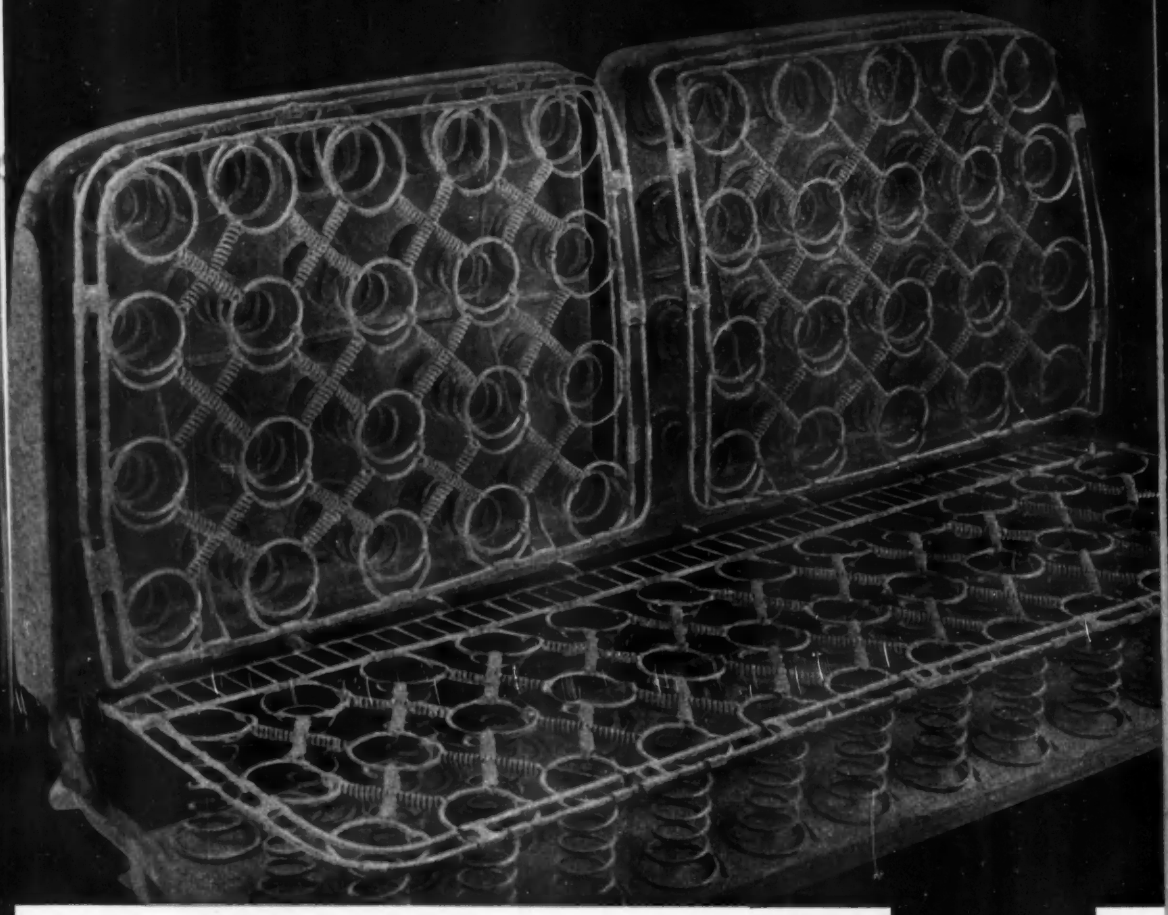
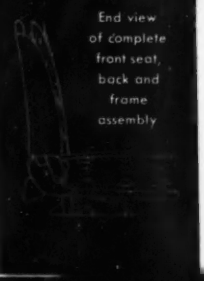
Complete Seating



Ready for Upholstering and Installation in the Car!

This radical new major development for factory installation in America's automobiles is definitely a revolutionary, enthusiastically received achievement in greater riding comfort at lower cost! To make this new design possible, L. A. Young Spring & Wire Corporation, for the first time is now producing steel tubing to make the seat and back frames, and combining them with superior L. A. Young coil springs in one complete assembly. Thus, car manufacturers can now save two ways! (1) . . . they pay less for these *complete* L. A. Young assemblies, and (2) . . . they can reduce their costs to upholster and install them in new cars! L. A. Young engineers can help you.



End view of complete front seat, back and frame assembly

NEW *Assembly!*

Now! "LUXURY COMFORT" *at Lower Cost!*

Just Being Announced, But Already Accepted For Cars of Leading Make!

Result of 45 years of L. A. Young Leadership in Automotive Seating Engineering!

Combines Strong Tubular Frames With Dependable Coil Springs in One Integral Unit!

Amazingly Simplified Design That Saves Greatly on Critical Materials!

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Introduces New Combination of Materials Assembled by Radical New Fool-Proof Method!

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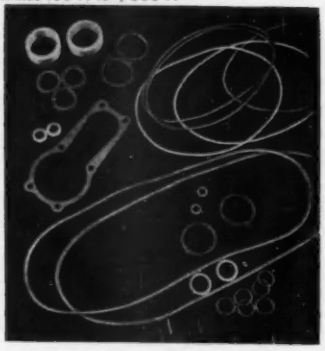
If what you make gets HOT or COLD or BOTH—you can SAVE by using SILICONE SEALS · GASKETS DIAPHRAGMS

Silastic (white) stays soft and flexible after 90 days of accelerated aging at 300°F. A high grade synthetic organic rubber loses almost all of its flexibility and becomes brittle after 3 days at 300°F

No matter what it is you make—from whipped cream dispensers to jet planes, you can save money by using H. O. Canfield seals, gaskets and diaphragms made of silicone. Silicone is the only elastomer that is undamaged by extremes of temperature. Silicone will remain soft and pliable at temperatures ranging from minus 100°F. to +500°F.



Here's how you save –

Although the first cost of silicone seals, gaskets and diaphragms is slightly higher than similar parts made of organic rubber, the use of silicone simplifies design and reduces production costs so much that the price of the material is negligible.

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WE CAN FABRICATE ANY SILICONE FORM YOU NEED

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AIRBRIEFS

(*Continued from page* 126)

U.S. Turbo Airliner Production

The first production contract for a gas turbine-powered transport has been placed with announcement that the Air Force has ordered the Convair T-29 trainer powered by two Allison T38 turboprop engines. Actually, the airplane will be equipped as bombardier and navigator flying classrooms but it is essentially the Convair "Turboliner," which made its first flight just a year ago. Only a small quantity is involved initially and the award is intended as a means of permitting the Air Force to examine the operational and maintenance problems of the type.

The new Air Force trainers differ from the standard Turboliner in the use of the new model 340 airframe, which is larger than the standard model 240 airframe used in the turboprop transport. Meanwhile, U. S. airliners have 385 piston-engine powered transport airplanes on order—and none for turboprops or turbojets. Simultaneously, British European Airways announces that henceforth it will order only gas turbine aircraft!

Munitions Board Revises Procurement Rules

Smaller firms should find it easier to get government contracts as a result of the Munitions Board's latest revisions to its procurement regulations. Small business specialists in each military procurement office are being instructed by the Munitions Board to screen all proposed procurements and to see that they are promptly publicized in the Commerce Dept. synopses of proposed purchases.

Under the new procurement procedure, all unclassified, advertised, and negotiated bids in excess of $10,000 will be reported in the Commerce Dept. daily bid synopses except (1) research and development projects; (2) procurement for studies and surveys; (3) major items of equipment such as tanks, engines, airframes, and ships when it can be clearly demonstrated that the item can only be manufactured, produced, or developed by large firms; (4) other items which small business firms could not supply because of patent rights, copyrights, or secretive processes; and (5) purchases which must be made too quickly to permit prospective contractors dependent upon the synopses for information to obtain the invitations to bid or requests for proposals and to prepare and submit the bids.

To the Executive Planning for TOMORROW...

Progressive engineers and designers know that *now* is the time to be planning and preparing for *tomorrow*. And the men who are *really* future-thinking have a little "mental-memo" tacked up in the corner of the drawing board . . . a memo that reads "Plan on using aluminum."

Designers and engineers who have used aluminum in experimental and present day models know it provides a lighter, tougher, longer-lasting construction.

You can't afford to overlook the advantages of planning with aluminum . . . its consistent low price in the face of rising costs of other metals, its corrosion resistance and ease of fabrication, its natural attractiveness.

Add to these advantages the fact that with supplies of bauxite ore ample for generations, plus expanding aluminum production facilities, you are assured of a steadily mounting supply of *tomorrow's main metal.*

Reynolds Aluminum Specialists are now working with many companies on their future designs. They will be glad to work with your designers and engineers to assure you of the maximum benefits of aluminum.

Today, call the Reynolds office listed under "Aluminum" in your classified telephone directory. Or, write to Reynolds Metals Company, 2587 South Third Street, Louisville 1, Kentucky.

and to the Man in Charge of

TODAY'S PRODUCTION!

Do you have a defense contract that specifies aluminum? To eliminate production problems, acquaint yourself with the accepted production techniques for fabricating aluminum. Write for complete list of Reynolds technical books covering every phase of fabrication. And for *special development* problems, take advantage of Reynolds trained staff of aluminum specialists.

BE SURE TO see Kate Smith Family Hour every Wednesday, NBC-TV, hear The Big Show with Tallulah Bankhead every Sunday, NBC Radio Network . . . consult newspaper for local time and station.

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

The Business Pulse

(*Continued from page* 54)

depends partly on other factors—labor-management relations and transportation are two major variables — many seem to feel that some so-called shortages are artificial or "paper" shortages and that proper allocation and distribution of current supplies by officials cognizant of the actual needs of the various firms would result in alleviation of the alleged tightness in some commodities.

Some observers, moreover, think that there may be more slack in future allocations than official forecasts allow. Cuts in distribution to a number of industries have been less than expected, and an official tendency to overstate the future demand for military equipment has been noted. Lagging defense deliveries have been admitted and widely commented upon, and some experts suspect that the rate of acceleration in the next quarter may be less than predicted. Since inventories are theoretically regulated, this would mean that more material could be made available for consumers' goods output, should these estimates prove accurate.

Expanding Government Payrolls

There are some behind-the-scenes factors in the total outlook. One of considerable importance is that although personal income in August increased to a record annual rate of $254 billion, or $2 billion above the July figure, wages and salaries paid by private industry were virtually unchanged. The greater part of the advance originated in expanding Government payrolls and increased agricultural income. Of equal relevance is the fact that corporate profits are declining on a year-to-year basis, mainly because of taxes. Manufacturers' sales for teh second quarter amounted to $53.4 billion, or about $10 billion above sales for the same quarter last year. Profits before tax payments were 34 per cent higher. After tax payments of roughly twice the amount paid in the second quarter of last year, manufacturers' profits were $100 million lower than comparable profits in 1950.

The net profits situation, however, seems to have had little influence on plans for equipment and plant expenditures in the fourth quarter. Although capital investment on a quarterly basis is leveling off slightly, total cash outlays for 1951 are placed at $25 billion, as compared with less than $19 billion in 1950. Most of the increase is due to a 60 per cent rise in outlays by manufacturing industries. In this sector it is apparent that defense and defense-supporting firms are responsible for the main portion of the year-to-year increase. Planned capital outlays by primary iron and steel, non-electrical machinery, non-automotive transportation equipment, and primary nonferrous metals manufacturers vary from 200 to 400 per cent above investment last year. Capital investment by non-manufacturing concerns is scheduled to rise little more than 10 per cent.

Patchwork Tax Law

It is altogether likely that by this time business planning has largely discounted the future effects of the new tax law passed in late October. Many economists and tax authorities had hoped early in the year, when Congressional leaders promised to review the entire tax structure, that a logical and equitable system of levies would evolve from the investigation. After conducting extended hearings for well over six months, and after considering sound and well-reasoned proposals both from the viewpoint of total yield and economic effect, the Congress finally decided to continue and broaden the

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JAN-P-116
JAN-P-117
AN-P-13-a

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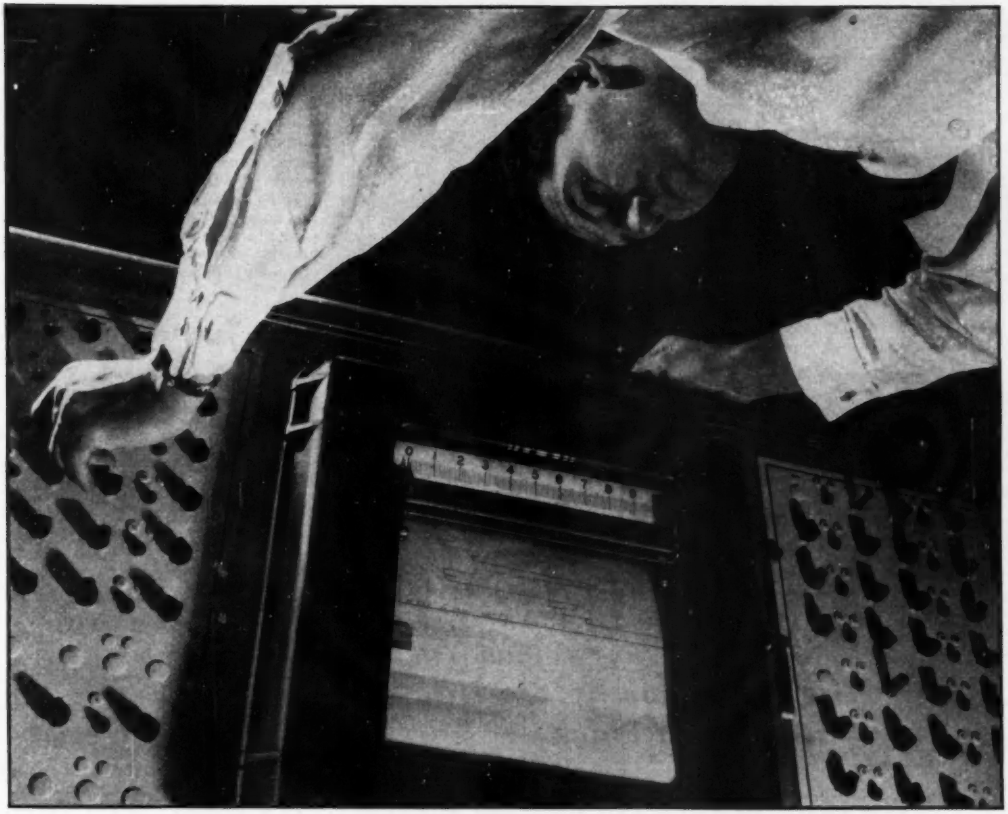

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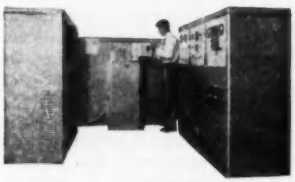
Expert scientific control makes ALUMICAST castings faultless



Illustrations above show the Quantometer which provides our laboratory technicians with a graphically recorded analysis of sixteen different elements—in less than three minutes. This assures the correct casting alloy composition in every "heat". You benefit because of expert scientific control ("E.S.C.").

There's no guesswork done at ALUMICAST. Every step from ingot to the finished casting is subject to scientific tests and controls to assure production of uniformly high quality castings. Right from the start every piece will meet your specifications.

No matter where you are located, you will find ALUMICAST a quick and dependable source for aluminum or magnesium castings. You are cordially invited to consult us relative to your civilian or defense needs.

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ALUMINUM and MAGNESIUM PERMANENT MOLD and DIE CASTINGS

"E.S.C." EXPERT SCIENTIFIC CONTROL

when the
FIRE WHISTLE
BLOWS

It's Too Late!

Let CARDOX Experience Plan Your Fire Protection Before Fire Wrecks Your Plans

In hundreds of plants the fire whistle may *never* blow! These are the plants where CARDOX Low Pressure Systems guard the "hot spots." So overwhelming and positive is the mass application of CARDOX CO_2 that fire seldom has a chance. The protection list includes practically every kind of flammable liquid or electrical hazard on the books—and scores of interesting Class A hazards as well.

CARDOX engineers *originated* low pressure carbon dioxide systems to stop fire cold at a time when existing protection just wasn't good enough. CARDOX research—millions of dollars and many thousands of days—advanced CARDOX Systems to their present perfection. From CARDOX experience with some of the world's toughest fire hazards have come a know-how in low pressure carbon dioxide, and a fire record, unapproachable.

The know-how and experience of CARDOX fire authorities can be of incalculable value in your protection planning. A CARDOX survey puts it at your disposal—costs you nothing. Write for a CARDOX survey today—now.

CARDOX
ORIGINATORS OF
LOW PRESSURE CO_2
Fire Extinguishing SYSTEMS*
First installation 1939, thousands since
Underwriters' approvals, 1940, 1941 • Factory Mutual approvals 1942

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patchwork character of revenue legislation.

The new law is expected to yield about $5,691 million in a full fiscal year. Individual income taxes will produce, it is believed, an additional $2,280 million, corporate taxes about $2,207 million, and excises $1,204 million. Since the Government will presumably receive less than half of this sum during the remainder of this fiscal year, the budgetary outlook for fiscal 1952 points to a deficit. An average of the various estimates would probably be about $6 billion.

Turboprop Research

(*Continued from page* 50)

and low-speed operation appeared to be the blended-hull and, in view of the broad background of experience with this form of body during the Skate project, it was selected for the preliminary studies.

Design Advantages

Considerable evidence was available that indicated many inherent advantages for this type of design, such as adequate static displacement, excellent stability and spray, facility for burying the engines within structure of high Mach section of low thickness and, of special interest for supersonic application, the inherent static transverse stability attained on the water without recourse to auxiliary wing tip flotation.

The dynamic flying model with the above-described configuration presented the results of applying this line of thought to a basic aerodynamic configuration incorporating a 60-deg delta wing. To account for the increased impact loads due to a higher getaway speed, the craft's deadrise was increased to give the same structural load required for conventional design. With power loadings that will be available, high deadrise hulls as indicated in this application hold out great promise for successful rough water operation at very high planing speeds.

The lines layout for this dynamic model produced a hull of very high length-beam ratio capable of supporting high load coefficients for a minimum of beam and, hence, retractable step mechanism. A wind tunnel model of this configuration indicated that the desired aerodynamic cleanliness and performance were attainable.

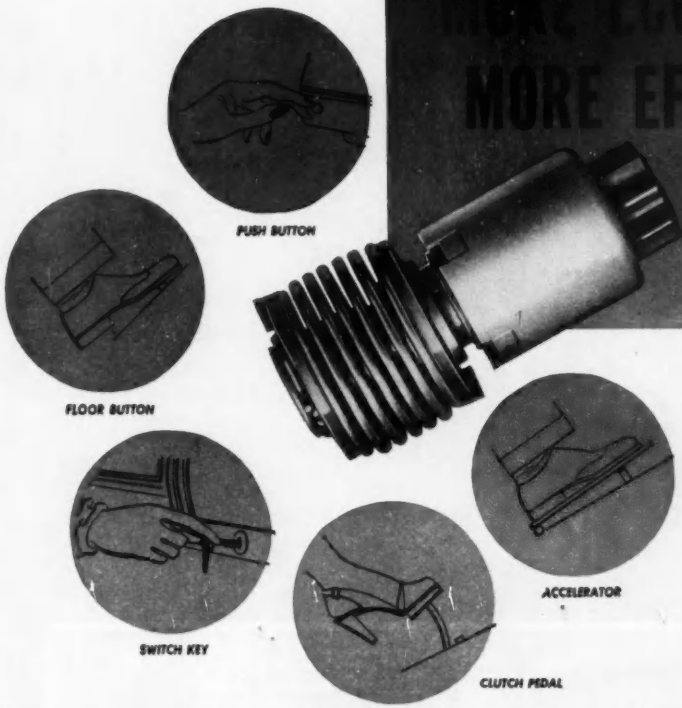
The above article is an abstract of a paper "A Review of High-Speed Hydrodynamic Development" presented recently by Mr. Stout before the Third International Joint Conference of the Institute of the Aeronautical Sciences and the Royal Aeronautical Society of Great Britain, held at Brighton, England.

Whatever Your Starting Requirements

Bendix STARTER DRIVE

MORE ECONOMICAL

MORE EFFICIENT!



SPECIALISTS IN ALL TYPES OF STARTING!

More than a quarter of a century ago, Bendix pioneered the starter drive. Today, and over 85,000,000 drives later, Bendix is still starter headquarters for industry. In automotive vehicles of all types, in the marine field, in stationary engines and aircraft, in fact wherever motors start, Bendix* Drives have established an unrivaled record for dependable performance. Perhaps even more remarkable is the fact that in most installations manufacturers have paid less for the Bendix Drive than for other types.

This unique combination of dependable performance and low cost is made possible by Bendix exclusive design features. For example, the Bendix Starter Drive requires no actuating linkage and the solenoid may be placed in any convenient position. Result—the starting motor can be mounted more easily and in more positions. Also the Bendix Drive has fewer parts and needs fewer adjustments.

If you want true economy from installation to service, plus performance proven by over 85,000,000 installations, be sure to specify Bendix Starter Drives. Your inquiry will receive immediate attention. *REG. U.S. PAT. OFF.

ECLIPSE MACHINE DIVISION of Bendix AVIATION CORPORATION

ELMIRA, NEW YORK

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

HOW TO GET THE MOST OUT OF Double-check

U-S-S Improved Heat Treatment is an improved method of quenching and tempering by means of violent agitation of the quenching bath. The basic engineering principles include quench tank design, and the definite size, number, placement and powering of the propellers.

THE ALLOY STEEL YOU'RE GETTING

your quenching methods

Here's how Jeffrey Manufacturing Company makes use of

U·S·S Improved Heat Treatment

—as told by Mr. C. S. Thomas, Chief Metallurgist

"We use U·S·S Improved Heat Treatment for batch hardening large parts, and continuously hardening small parts.

"We formerly had trouble with excessive and variable quench water temperature; this in turn caused uneven hardening. But now the U·S·S agitated quench process gives us uniform hardening almost without exception.

"It is now much easier to quench large parts, such as 100 pound alloy steel gears, because the man does not have to move the part. Instead, it hangs motionless in the quench while the agitated oil extracts heat rapidly and uniformly. The direct results are: increased production (less time needed for quenching), less chance for human error and more satisfactory hardening.

"Like many metallurgists, as soon as we have hardening trouble we look for trouble in the quench. U·S·S Improved Heat Treatment is providing an economical and efficient method of improving our quenching practice."

● Most of you who use alloy steel have one problem in common today; you must continue to turn out products of the same quality your customer is accustomed to, while using steels containing a smaller percentage of many of the important alloying elements.

To do this, many of you must look to new methods of developing the ultimate in mechanical properties in the leaner alloy steels. One of the best ways to get those maximum properties from leaner alloy steels is to make use of the best available heat treating practices. Utmost care must be given to *all* phases of heat treatment; heating, *quenching*, and tempering—keeping in mind the "H" value of *your* water or oil quench tank, and the hardenability of the steel you are using.

United States Steel Company has developed an improved agitated quenching method to give you better results with leaner alloy steels—or with most all steels for that matter. We call it U·S·S Improved Heat Treatment. The actual process includes quench tank design plus the definite size, number, placement and powering of the propellers that agitate the bath. This quenching method extracts the heat evenly and rapidly from the entire surface of the part.

Close to a hundred manufacturers are already using this improved quenching method, and without exception report better heat treating results. They cite the following advantages over methods which provide for no agitation or inadequate agitation of the quenching medium:

1. **Uniformity in mechanical properties throughout any one part and from one part to the next.**
2. **Deeper penetration of hardness with consequent higher over-all mechanical properties.**
3. **Reduction or elimination of retreats and rejections.**
4. **Reduction or elimination of warpage and cracking through uniformity of heat extraction.**

There is no charge for the use of this process. Furthermore, we will provide a metallurgical engineering analysis of your heat treating problems at no cost. It is simply part of our continuing effort to help you get the *most* out of the leaner alloy steels you're now getting.

UNITED STATES STEEL COMPANY, PITTSBURGH
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY COMPANY,
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

USS

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

1-1670

UNITED STATES STEEL

Titanium Industry Expands

By G. E. Hutchinson and E. L. Wemple, Rem-Cru Titanium, Inc.

TITANIUM possesses outstanding physical properties, including corrosion resistance, high strength, light weight and ductility. These are combined with excellent alloying possibilities which still further enhance the metal's properties.

The trends, particularly in the transportation field, are toward higher speed, lighter weight, higher strength, and severe corrosion conditions. Titanium's properties, being intermediate between aluminum and stainless steel, fill a gap which is being widened by these trends. The aircraft industry is especially interested in applying titanium because of its relatively high strength-weight ratio as compared with other materials, particularly in the intermediate temperaure range. Because of titanium's density, a 40 per cent reduction in weight can be achieved in the cases where it can be substituted section for section for ferrous alloys.

During a recent meeting with one of the large aircraft companies, the possibility of constructing major parts of a new supersonic plane from titanium was being discussed with key representatives of all of the operating departments of the company. Each representative had voiced his objections to the plan for the extensive use of titanium, when the assistant chief engineer pointed out that if the plane were made of aluminum, it would not be strong enough to fly and if it were made of stainless steel it would be too heavy too fly. He concluded this phase of the meeting with the directive that the plane would be made largely of titanium or not at all.

Thus, titanium is finding application in the following civilian and military services:

(1) Airframe skins and structures where intermediate temperatures or corrosion problems are found.

(2) Aircraft power plants where temperatures between 300 F and 1000 F are involved.

(3) Naval or marine applications in which the combination of superior corrosion resistance and light weight are important.

(4) Industrial equipment in which titanium's particular corrosion resistance can be utilized.

(5) Ordnance and other equipment in which a combination of light weight, corrosion resistance, high strength and/or intermediate temperature properties are required.

When the cost of titanium is reduced to the point where it is directly competitive with other structural materials, the entire transportation and moving machinery fields as well as others will open up as potential markets.

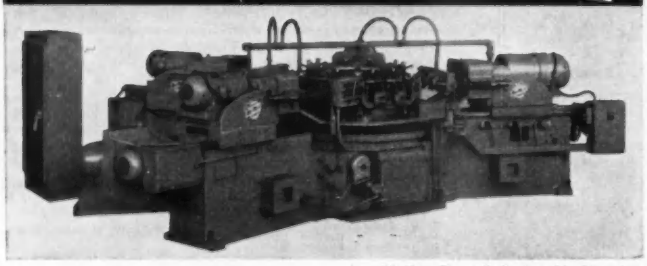
A large number of companies have entered or are entering the titanium metal field. Those companies who have exporessed themselves as interested in manufacturing titanium sponge are: du Pont, National Lead. New Jersey Zinc, Kennicut Copper, Horizons Titanium, National Research and Monsanto, Dominion Magnesium and Crane Co.

The announced primary fabricators in the titanium field are Rem-Cru Titanium, Inc., which is a company owned by the Remington Arms Co. and the Crucible Steel Co.; Allegheny Ludlum, which with National Lead, owns a sales company called Titanium Metals Corp.; P. R. Mallory and the Sharon Steel Co. which have combined to process titanium: and Republic Steel Corp.

Sizable expansion in production facilities has already been undertaken and larger production facilities are being authorized. The significance that this growth is taking place with titanium sheet, bar and forgings still selling at premium prices; i.e. $10 to $20 per lb depending upon quantity, size, etc.

As an example of the expansion which is underway, Rem-Cru Titanium, Inc., has recently set up facilities for

Drilling and Reaming
388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

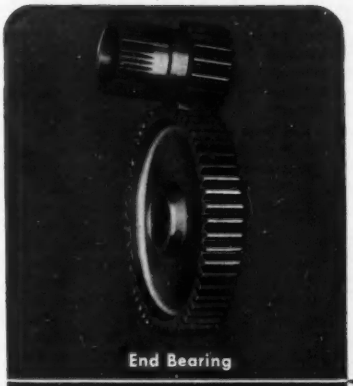
Free Data

Will be furnished on request.

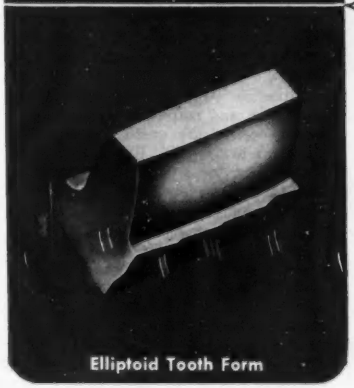
DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company
6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

BASIC FACTS ON GEAR TOOTH CROWNING



End Bearing



Elliptoid Tooth Form

Q. *Why are gear teeth given the Elliptoid tooth form or crowned?*

A. To PREVENT "end bearing" in service.

Q. *What is "end bearing"?*

A. A concentration of load at the end of the tooth due to end contact between teeth rather than its distribution along the entire tooth face —the condition for which the tooth was designed.

Q. *Why is "end bearing" objectionable?*

A. Because it imposes concentrated stresses beyond the fatigue strength of the material at the contact point which may lead to premature failure. It is also an important cause of noisy gear operation.

Q. *What is gear tooth crowning?*

A. A calculated elliptical reduction in tooth thickness from the point of maximum crown (usually the center) toward both ends. Normally it amounts to .0003" per inch of face width per side, but this is optional depending on service conditions.

Q. *Can "end bearing" be avoided by any other method?*

A. No. Because

1. It is practically impossible to assure perfect alignment under all conditions of loading due to unavoidable deflections in shafts, bearings and the mountings, all of which are elastic.

2. It is also impracticable to avoid all fire distortion in hardening gears which have been machined previously.

Q. *How are gear teeth crowned?*

A. On Red Ring Shaving Machines.

Q. *Can the amount of crown be controlled accurately?*

A. Positively. Such a large number of leading automotive gear plants would not be using it otherwise.

Crowning is controlled on the Model GCI Shaving Machine by locking the cam which actuates the table movement at the desired point. Models GCU and GCV use formed cutters ground precisely to the amount of crown required. No variation is possible without changing cutters.

In a random check of 4000, 1" face gears the maximum variation in the amount of crown was within the specified tolerance of .0002".

Write for
BULLETIN 549-5
for a more detailed discussion of gear tooth crowning.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

forgings

by

KROPP

One-piece forged part for a large landing gear. 4'1½" long—2'6½" wide across the "Y"—weight 285 lbs.

Only the best of steel is good enough to take the shock and stress of landing tons of fast moving weight in the heavy planes of today. And the best steel is *forged steel* . . . best in toughness, fatigue resistance, uniformity and savings in weight. The amount of improvement imparted to the steel by forging is determined by the equipment used and the skill of the craftsmen.

Kropp forgings are forgings at their best . . . produced with modern equipment by skilled hammermen, die makers and machinists with many years of forging experience.

That's why Kropp is depended upon to make so many parts for America's defense . . . thousands of pieces daily for planes, ships, tanks and guns to help keep America strong.

The complete drop, hammer and upset forging facilities of *America's Number One Forge Plant* are at your service.

KROPP FORGE COMPANY
5301 W. Roosevelt Rd., Chicago 50, Ill.

Are you receiving "FORGINGS" . . . . the KROPP publication for industry? If you want to keep current on forging facts, send us your name and address and ask for "FORGINGS".

titanium at Crucibles Midland, Pa., plant, 35 miles northwest of Pittsburgh. The general and administrative offices, a very adequate research laboratory and a completely new melt shop, have been located there.

Five hundred lb ingots are now being made at the rate of several per day and within the next few weeks this will be increased to several 1000 lb ingots per day. A new furnace is now under construction that will soon substantially increase the ingot capacity.

With these facilities and all of Crucible's other widely diversified equipment for processing high alloy, stainless and tool steels, Rem-Cru is in a position to supply both unalloyed titanium and titanium alloys in a wide range of normal commercial sizes of bar and sheet, forged billets, simple hammer forgings and heavy plate. Narrow and wide strip, wire and welded tubing will be available as demands develop.

The cost of any material of construction is directly related to its consumption and vice versa. Titanium is no exception, and its present high cost is associated with its low consumption in a vicious circle type of relationship. It is believed that when the annual consumption of ductile titanium reaches a few thousand tons annually, the cost of raw material will be no higher than perhaps $1.50 or $2.50 per lb at which level the cost of primary fabricated forms will be in the neighborhood of $3.50 to $6 per lb. With still greater consumption both sponge and finished material may be produced at costs and sold at prices far below such figures as these.

Titanium ranks just below aluminum, iron and magnesium in terms of abundance in the earth's crust. The time has arrived for titanium to take its position as a structural material with these so widely used metals.

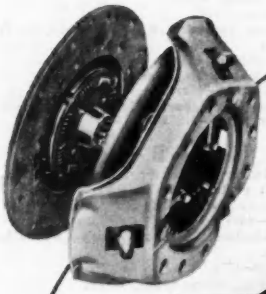
The foundation of the titanium industry has been firmly established, in that: (1) The material has outstanding properties. (2) There exists a general demand for these properties which is being accentuated by the defense program. (3) The raw material in the form of ore supplies is strategically available. (4) Industry has shown its ability to handle the job.

The above is an extract from a paper presented by the authors at the Philadelphia regional meeting of the American Iron and Steel Institute.

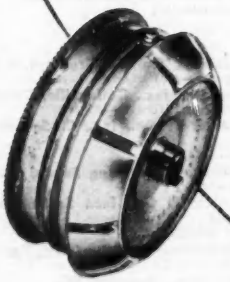
AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING



Versatility



We've been a part of the automotive industry since its start. A half-century of production has given us our share of experience.

Our engineers have the ability and vision to "see" the answers to design problems. Our manufacturing flexibility permits quick translation of these answers into finished units.

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BORG-WARNER CORPORATION
DETROIT 12, and WINDSOR, ONT.

ENGINEERING B-W PRODUCTION

LONG

CLUTCHES • RADIATORS • TORQUE CONVERTERS
OIL COOLERS

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to September 21 authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which were published in the October 15 issue, page 122, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Defense Production Administration between September 21 and October 17.

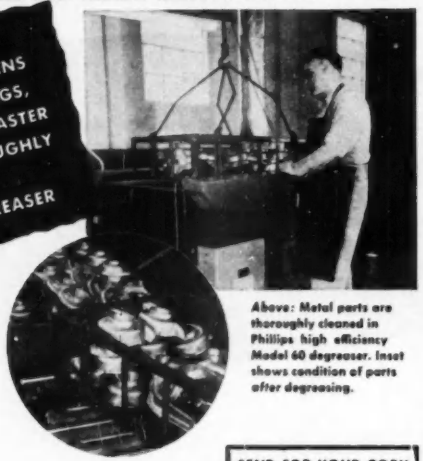
Included in this latest tabulation, 4119 new or expanded defense facilities of all types have been authorized for rapid tax write-off, the total amount eligible for amortization being $9,692,880,210. These figures are exclusive of cases that are up for later review but included in this list — in these cases no dollar amount is listed. The figure appearing in parentheses is the percentage authorized for actual fast tax write-off.

Certificates listed without a dollar value are those in which a portion of the facilities involved in the application was completed or acquired prior to Sept. 23, 1950.

ENGINEERED SERVICE

PHILLIPS

POWER TOOL MANUFACTURER CLEANS CASTINGS, STAMPINGS, MACHINED PARTS, FASTER AND MORE THOROUGHLY WITH A PHILLIPS DEGREASER



Above: Metal parts are thoroughly cleaned in Phillips high efficiency Model 60 degreaser. Inset shows condition of parts after degreasing.

Skilsaw reports improved cleaning before painting and assembly.

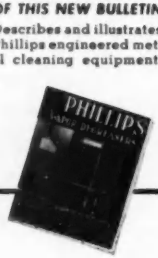
HERE is another case illustrating the high cleaning efficiency of Phillips degreasers. Skilsaw, Inc., Chicago, uses a Phillips Model 60 electric batch-type machine to clean both aluminum and iron castings, steel stampings, shafts and screw machine parts. These parts must be thoroughly cleaned before painting and assembly of the finished product. Among the types of soil removed are coolants, kerosene, drawing oils, and just plain shop dirt.

Skilsaw reports that the Phillips unit cleans their parts better, as well as 3 to 4 times faster than their former method. Thus production is speeded up and better control is assured over the quality of the finished product.

Check into the time and money you can save with Phillips Vapor Degreasing. Our representative will be glad to discuss your parts cleaning problem with you.

SEND FOR YOUR COPY OF THIS NEW BULLETIN

Describes and illustrates Phillips engineered metal cleaning equipment.



Phillips MANUFACTURING COMPANY

3465 TOUHY AVENUE • CHICAGO 45, ILLINOIS

ENGINEERED METAL CLEANING EQUIPMENT

BATCH TYPE DEGREASERS | COMBINATION DEGREASERS | "ROTOMATIC" DEGREASERS | CONVEYOR TYPE DEGREASERS | "TORRENT" WASHERS

— A —

American Brake Shoe Co., Chicago, Ill.
Steel forgings—(75)

American Brake Shoe Co., Winchester, Va.
Frictional elements brakes—(60)

American Helicopter Co., Inc., Manhattan Beach, Calif.
Helicopters—(80)

American Locomotive Co., Auburn, N. Y. plant
Diesel engines—(60)

The Anderson Co., Gary, Ind.
Vehicle parts—(60)

Austenal Laboratories, Inc., Chicago, Ill.
Military items—$130,860 (75)

— B —

B. H. Aaircraft Co., Farmingdale, N. Y.
Aircraft parts—(75)

Baldwin-Lima-Hamilton Corp., Lima, Ohio
Cranes—(60)

Bohn Aluminum & Brass Corp., Detroit, Mich.
Bearings—(75)

Brace, Inc., Minneapolis, Minn.
Aircraft parts—(75)

Bucyrus-Erie Co., Evansville, Ind.
Cranes—(50)

Bucyrus-Erie Co., South Milwaukee, Wis.
Cranes—(50)

— C —

Caterpillar Tractor Co., Peoria, Ill.
Tractors—(50)

Clifford Mfg. Co., Div. of Standard-Thomson Corp., Waltham, Mass.
Aircraft parts—$20,563 (75)

Clinton Machine Co., Maquoketa, Iowa
Gasoline engines—(75)

Cooper Precision Products, Los Angeles, Calif.
Aircraft bolts and screws—(60)

Cummins Engine Co., Columbus, Ind.
Diesel engines—(60)

— D —

Daco Machine & Tool Co., Brooklyn, N. Y.
Aircraft parts—(90)

Dixon Mfg. Co., Inc., Coffeyville, Kansas
Spare parts for aircraft—(85)

Douglas Aircraft Co., Inc., El Segundo, Calif.
Airplanes—(35)

Douglas Aircraft Co., Long Beach, Calif.
Airplanes—(35)

Douglas Aircraft Co., Inc., Santa Monica, Calif.
Airplanes, missiles—(35)

Dresser Industries, Inc., Bradford, Pa.
Aircraft parts—(75)

Dynamatic Corp., Kenosha, Wis.
Clutches, dynamometers—(80)

— E —

Thomas A. Edison, Inc., Belleville, N. J.
Storage batteries—(60)

— F —

Fairchild Engine & Airplane Corp., Long Island, N. Y.
Aircraft equipment—$1,940,000 (75)

— G —

General Motors Corp., Bristol, Conn.
Ball bearings—(75)

General Motors Corp., Danville, Ill.
Iron castings—(75)

(*Turn to page 146, please*)

Strengthening

the **production** *arm of the nation...*

IN the factories of car builders, engine builders and other American industries, special SUN Testing Instruments are adding muscle to the nation's production arm. Finer, more efficient vehicles, engines and other machinery are being produced with substantial savings in time, costs and manpower by substituting "Testwork" for "Guesswork" with these SUN Precision Instruments.

Transportation, a key factor in the production arm of the nation, is likewise being strengthened through the use of SUN Testing Equipment. Tens of thousands of the nation's largest repair and maintenance shops depend on SUN Testing Instruments to quickly locate causes of engine failure.

Literally thousands of SUN Precision Testing Instruments are built yearly to supply American industrial, military and governmental needs. SUN welcomes the opportunity to apply its long years of experience in the precision testing instrument field to help solve problems that will further strengthen the production arm of the nation.

Sun
ELECTRIC CORPORATION
6323 Avondale Avenue, Chicago 31, Ill.

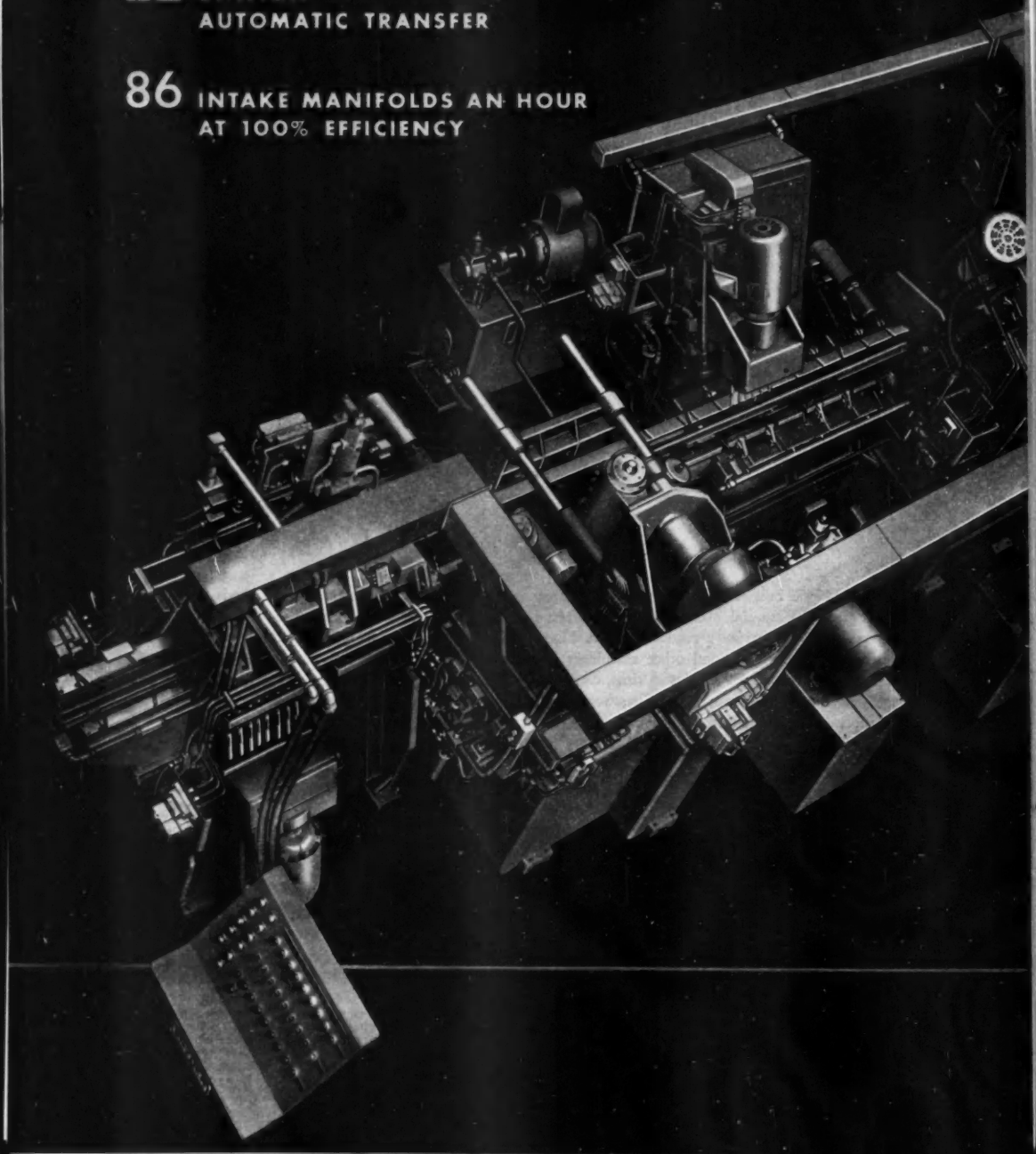
SUN Diagnosis Service and Equipment is familiar to many millions of American motorists and servicemen across the nation. Over 300 SUN Field Representatives assure the efficiency of this service by training mechanics, servicing equipment and guiding Diagnosis Procedures. In addition, 17 strategically located SUN Technical Training Schools that provide specialized advanced training for "key" operators.

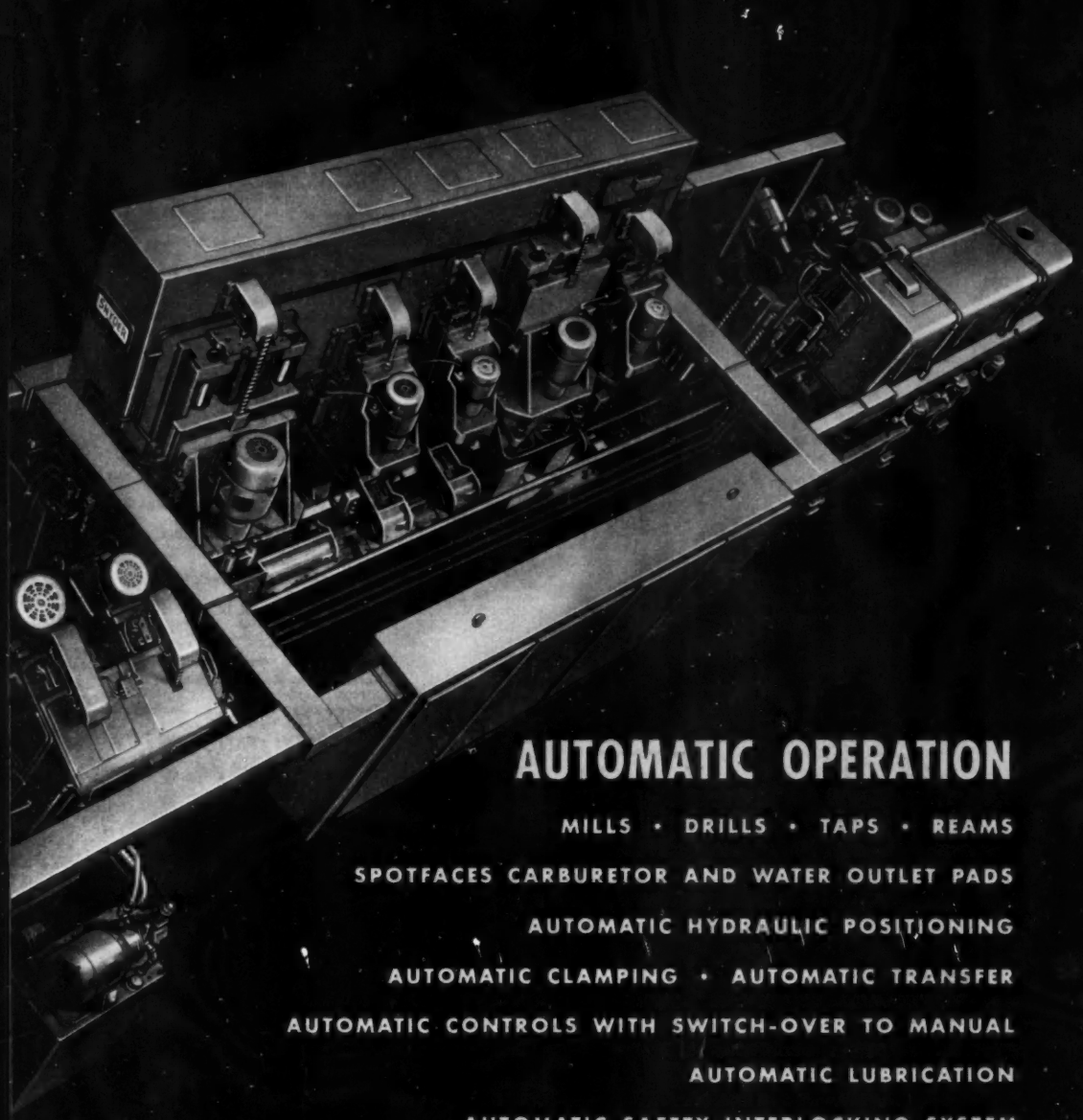
R-5311

SNYDER MACHINES CONTROL COSTS

22 STATION
AUTOMATIC TRANSFER

86 INTAKE MANIFOLDS AN HOUR
AT 100% EFFICIENCY





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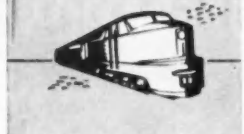
GEARS *by Fairfield*



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IF GEARS are a part of the machines you make, there is no finer recommendation for YOUR PRODUCT than to be able to say it is "Equipped with FAIRFIELD GEARS!"

At Fairfield, your gears are in the hands of specialists equipped with every modern facility for producing fine gears efficiently and economically. *For the Best in Gears, Specify Fairfield!*

Gears made to order:

SPUR • HELICAL • HERRINGBONE • SPIRAL BEVEL STRAIGHT BEVEL • HYPOID • ZEROL • WORMS and WORM GEARS • SPLINED SHAFTS • DIFFERENTIALS

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LAFAYETTE, IND.

Send for Illustrated Brochure

for FINE GEARS

(*Continued from page* 142)

General Motors Corp., Indianapolis, Ind.
Development and research—(75)
Cross drive transmissions—(75)
General Motors Corp., Meriden, Conn.
Ball bearings—(75)
General Motors Corp., Milford, Mich.
Test facility military vehicles—(75)
General Motors Corp., Clark Township, Rahway, N. J.
Roller bearings—(60)
General Motors Corp., Sandusky, Ohio
Ball bearings—(75)
General Motors Corp., Warren, Ohio
Military items—(75)
Goodyear Aircraft Corp., Akron, Ohio
Aircraft—(75)
Govro-Nelson Co., Detroit, Mich.
Aircraft parts—(90)

— H —

Harnischfeger Corp., Milwaukee, Wis.
Traveling cranes—(60)
Harnischfeger Corp., West Allis, Wis.
Industrial equipment—(60)
Honeycomb Co. of America, Inc., Los Angeles, Calif.
Aircraft parts—(75)
Hydro-Aire, Inc., Burbank, Calif.
Aircraft parts—(80)
Hyster Co., Peoria, Ill.
Tractor cranes—(60)

— K —

Kamis Engr. Co., Philadelphia, Pa.
Aircraft parts—(80)
Kelsey-Hayes Wheel Co., Jackson, Mich.
Ordnance items—(75)
Kenyon Instruments Co., Long Island, N. Y.
Aircraft parts—(90)

— L —

Lear, Inc., Grand Rapids, Mich.
Automatic pilots—(85)
Lear, Inc., Los Angeles, Calif.
Control systems—(75)
Lord Mfg. Co., Erie, Pa.
Aircraft parts—(80)
H. W. Loud Machine Works, Inc., Pomona, Calif.
Wing fittings (aircraft)—$88,110 (90)

— O —

O & M Machine Co., Los Angeles, Calif.
Aircraft parts—(85)
The Ohio Rubber Co., Willoughby, Ohio
Tank tracks—(75)

— P —

Pierson Machine Co., Los Angeles, Calif.
Aircraft parts—(85)

— R —

Reo Motors, Inc., Lansing, Mich.
Engines, trucks—(75)
Resistoflex Corp., Belleville, N. J.
Aircraft fittings—(80)

— S —

Specialty Screw Machine Products Co., Lancaster, Pa.
Metal parts for aircraft—(70)
Stewart-Warner Corp., Chicago, Ill.
Tachometers—(75)

— T —

Thew Shovel Co., Lorain, Ohio
Cranes—(50)
Tinnerman Products, Inc., Cleveland, O.
Fastening devices—(60)
Tube Turns, Inc., Louisville, Ky.
Aircraft cylinder heads—$1,386,096 (75)

(*Turn to page* 148, *please*)

Here's Le Roi's sensational "Advanced Design" engine

...the most modern power plant available for heavy-duty trucks

Ask for this engine when you buy your new heavy-duty truck. You get 200 hp from a smooth-running, high compression V-8 engine — a sensationally new engine that gives you greater economy and longer life. Just look at these features:

- ★ Modern V-8, high-compression, valve-in-head design!
- ★ 207 horsepower — speed range, 800 to 3200 RPM
- ★ Lowest weight to horsepower ratio in the industry — only 6 lbs. per HP! You carry bigger payloads.
- ★ Most compact engine in its horsepower range—overall length only 43"!
- ★ Faster acceleration — quick response results from short stroke, light flywheel, and 8-cylinder power impulses!
- ★ Good high-speed performance — large bore and short stroke provide ample valve area. Unique combustion chamber shape having ample quench area retards detonation!
- ★ Smoother running engine at all speeds — extra rigidity of short box-like crankcase and five large main bearings reduce vibration!
- ★ Long life—replaceable, wet cylinder sleeves wear well, are inexpensive to replace. Stellite valves and seats and positive-type rotators promote long valve life—chrome-plated top ring adds extra miles between overhaul.

So, for better performance and lower operating costs, be sure your new heavy-duty trucks are powered with a Le Roi H-540. The coupon below will bring you a new H-540 catalog and specification sheet. Send for them today.

Condensed H-540 Specifications

Number of cylinders	8
Bore and stroke, inches	4½ x 4¼
Displacement, cubic inches	540
Horsepower, rated at rpm	207/3000
Weight bare, lbs.	1250

....Tear out this coupon and mail TODAY!....

LE ROI COMPANY, Dept. E-71B
1706 S. 68th Street, Milwaukee 14, Wisconsin

Please send me complete information on the "advanced design" features of your new H-540 engine for heavy-duty trucks.

Name.....Position.....

Company.....

Company Address.....

City.....(.....) State.....

LE ROI COMPANY
MILWAUKEE 14, WISCONSIN
Plants: Milwaukee • Cleveland • Greenwich, Ohio

E-71

(*Continued from page* 146)

— U —

Union Carbide and Carbon Corp. (National Carbon Co.), Cleveland, Ohio.
Military batteries—(75)

— V —

Vard, Inc., Pasadena, Calif.
Aircraft parts—(80)

Vassar Electroloy Products, Inc., Vassar, Mich.
Automotive transmission parts—(75)

— W —

Westinghouse Electric Corp., Baltimore, Md.
Military items—(75)

New Automatic Fuel Control for J-57 Turbojet Engine

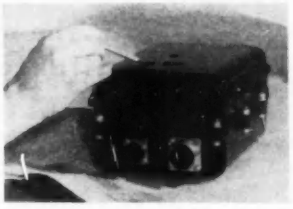
PRATT & WHITNEY'S powerful J-57 turbojet is equipped with a new fuel control developed by Hamilton Standard Div., United Aircraft Corp. which combines an electronic brain with a hydro-mechanical unit. The fuel control has passed cell tests on the J-57, and now a flight testing program is underway.

In order to achieve maximum efficiency, a gas turbine engine must operate at close to its critical limits of power and strength. The new control governs turbine-wheel speeds and restricts the amount of fuel admitted to the combustion chambers according to the engine's speed, temperature of the incoming air, and tailpipe temperature. As a governor, it is capable of maintaining the desired turbine-wheel speed to within plus or minus 0.25 per cent.

The electronic unit, which generates its own electrical current, utilizes a system of vacuum tubes, resistors, condensers and thermocouples. Any tendency by the engine to exceed its design limits is promptly controlled by the electronic unit which signals the hydraulic unit to reduce the flow of fuel to the engine.

Actual fuel flow, which is controlled by a throttle valve, is determined by the movement of a pilot valve in response to the application of current to a solenoid whose armature position varies with impressed voltage. Voltage applied to the solenoid is determined by the electronic unit in accordance with the flight requirements and the readings it is constantly taking of the engine operation.

The hydraulic unit, in addition to serving the electronic brain, performs extra functions to prevent the engine from exceeding operational limits. It measures the pressure of air in the engine's compressor section, and establishes a proportional minimum limit to the flow of fuel to the engine at a level which prevents lean blowout of the combustion during deceleration. In the event that air pressures are building up to the design limit, it limits the flow to the engine, thus curtailing engine speed, temperature and compressor pressure.



The electronic control which utilizes a system of vacuum tubes, resistors, condensers and thermocouples.

Tiny sub-assemblies of the electronic unit are placed in molds and engulfed in a liquid resin, which hardens within an hour, forming a protective housing. Special sockets are provided in the brain for each of the resin housings. Added protection is provided by the air-tight magnesium casting used to en-

Proved IN MANY SERVICES

Lamb Electric

SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

• Typical of the fields in which Lamb Electric Motors have gained a reputation for outstanding performance, are aircraft components, business machines, industrial and commercial equipment, household appliances, machine tools and portable electric tools.

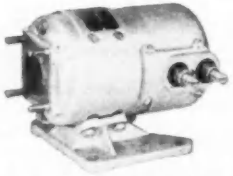
Back of the good performance of Lamb Electric Motors is the fact that each motor is designed for a particular product or device, thereby insuring exact mechanical and electrical requirements.

In addition to providing dependability, this *special engineering* usually results in savings in space, weight and cost factor.

The Lamb Electric Company
Kent, Ohio

THEY'RE POWERING
AMERICA'S *Finest* PRODUCTS

Geared head motor with reversing switch, adaptable to many heavy-duty, slow-speed applications.

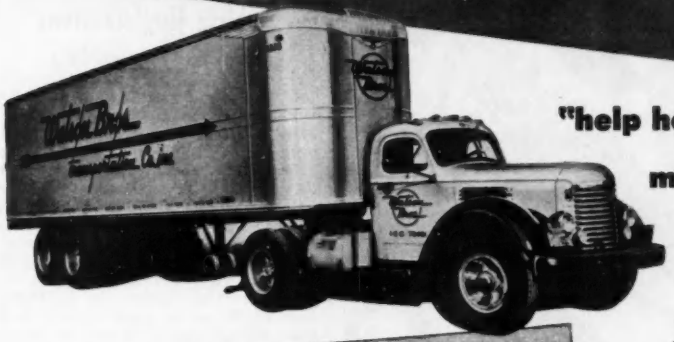


Motor with high horsepower to low weight factor for either direct drive or use with external gear reduction.

Lamb Electric

SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

Wagner Air Brakes



"help hold our maintenance to an absolute minimum in our more than *30,000,000* miles a year operation"

MARK S. BORLAND
Watson Bros. Transporation Co., Inc.

WATSON · BROS · TRANSPORTATION · CO · INC

U. S. CUSTOM BONDED ESTABLISHED 1906

GENERAL OFFICES 808 SO. 10TH STREET OMAHA, NEBRASKA

"Every Twenty-four Hours Twice around the World"

October 3, 1950.

Wagner Electric Corporation
715 North 17th Street
Omaha, Nebraska

Gentlemen:

I am happy to advise that our company has been a user of Wagner Air Brake equipment for many years.

We have found your equipment to be of the highest quality. We particularly want to mention the very efficient operation of your rotary compressor.

In a business like ours, operating in excess of thirty million miles a year from Chicago, Illinois to Los Angeles, California and from Minneapolis-St. Paul, Minnesota to St. Louis, Missouri on daily schedules, it is essential to hold our maintenance cost to an absolute minimum.

We have found that your Wagner rotary compressors require a minimum of maintenance and have played a large part in reducing our over-all maintenance cost.

Yours very truly,
WATSON BROS. TRANSPORTATION CO., INC

Mark S. Borland

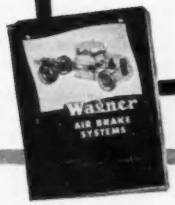
MARK S. BORLAND, Purchasing Agent

MSB:er

Safe, trouble-free, dependable brakes are an all-important consideration in the profitable operation of over-the-road fleets. Today, loads are heavier . . . runs are longer . . . and competition is keener. Vehicles "laid up" for repairs because of accidents caused by faulty brakes mean lost revenue. Be sure of your brakes—install Wagner Air Brakes and you will find your brake maintenance costs going down and your payload profits going up.

Thousands of heavy-duty vehicles equipped with Wagner Air Brakes safely travel many millions of miles each year. Give the vehicles you manufacture real brake economy by including Wagner Air Brakes—the only system with the Rotary Air Compressor . . . as standard equipment.

Wagner Air Brake Users are our Biggest Boosters.



Write Today for Bulletin KU-201

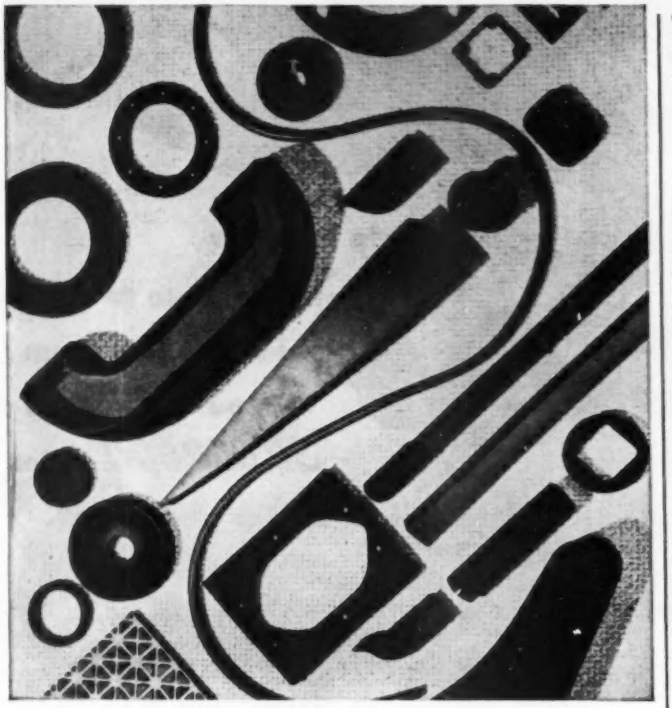
Wagner Electric Corporation

6363 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

(Branches in Principal Cities and in Canada)

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID . . . NoReL . . . CoMaX BRAKE LINING . . . AIR BRAKES . . . TACHOGRAPHS . . . ELECTRIC MOTORS . . . TRANSFORMERS . . . INDUSTRIAL BRAKES

K51-12A



HOW INDUSTRY IS USING RUBATEX CLOSED CELL RUBBER

Product engineers in industries have found RUBATEX Closed Cell Rubber the ideal material for uses such as these:

Gaskets
Automobile arm rests
Anti-squeak pads
Dust barriers
Low temperature insulation
Packing cushion for fragile goods
Flotation devices
Athletic shock padding
Gymnasium mats
Kneeling pads
Crash pads
Fatigue mats
Expansion joint filler
Arctic equipment
Shoe innersoles
Typewriter cushions
Rug underpad
Seat cushions
Bath and kitchen mats
Crib and play-pen mats
Weather stripping
Vibration damping

RUBATEX is light in weight, buoyant, and has good compressive strength. It cannot absorb moisture even at cut edges. RUBATEX is rot and vermin proof and sanitary. There is a big economy factor to RUBATEX. Most gasket requirements can be cut from sheet stock without need for the expense of a molded-on skin. RUBATEX is available in natural and synthetic stocks and in soft, medium and firm forms. For more information, write for Catalog, RBS-12-49, Great American Industries, Inc., RUBATEX DIVISION, BEDFORD, VIRGINIA.

Photo-micrograph of RUBATEX closed cellular rubber shows the tiny individually sealed balloon-like chambers which retain inert nitrogen under pressure.

RUBATEX

CLOSED CELL RUBBER

ZERO MOISTURE ABSORPTION
RESILIENT AT LOW TEMPERATURES
EXCELLENT SHOCK ABSORPTION

case the entire electronic unit. A safety feature of the device is the use of duplicate vacuum tubes to take over the function of any tubes that may fail.

Vehicle Registrations

(*Continued from page 51*)

these vehicle registrations 42,547,380 will be passenger cars, with an indicated increase of about six per cent over the 39,952,380 registered during 1950. Trucks and buses combined will total 8,865,913 as compared with 8,318,721, an increase of about 6.6 per cent.

Since the end of World War II in 1945 there is an indicated increase of 20,989,000 cars, trucks and buses or 69 per cent. Passenger cars will have increased in registrations by 17,148,000 units or 68 per cent while trucks and buses have gained 76 per cent or 3,841,000 units. These tremendous increases have occurred within the short space of time of six years. Prior to the World War II it took a period of seventeen years, from 1925 to 1941, to secure a nearly comparable percentage increase.

These registration data are the results of an annual survey conducted by AUTOMOTIVE INDUSTRIES for the purpose of establishing a sound estimate of what may be expected in the way of registrations by the end of the 1951 registration year. Forty-four states and the District of Columbia cooperated with us in this survey, furnishing in most cases actual registrations up to October 1, 1951, and then supplying their estimate for the remainder of their registration year.

On the basis of these returns 16 states will show over one million registrations. These 16 states, which account for 33 per cent of all the states and the District of Columbia, contain 68 per cent of the motor vehicles registered throughout the country. Two of these 16 states, California and New York, will show 4 million or more vehicle registrations. Pennsylvania and Texas both have over 3 million. California will still be the number one state with 4,768,000 registrations, New York second with around 4 million, Pennsylvania third with 3,232,785 and Texas fourth with 3,063,003 motor vehicle registrations. Twelve other states will have registrations from one million to three million. Ohio will lead this group followed by Illinois, Michigan, New Jersey, Indiana, Massachusetts, Missouri, Wisconsin, Minnesota, North Carolina, Iowa and Florida in the order named.

While the population of the country is increasing at a very rapid rate, the growth in motor vehicle registrations is at a much greater rate. This is evidenced by the fact that back in 1935 there was one motor vehicle to every 4.8 persons in the country, while as of the end of 1951 there will be only three persons (including the armed forces abroad) to every motor vehicle.

Again Houghton ANTISEP ALL PURPOSE BASE Triumphs Over Straight Cutting Oils!

Out-performing straight oils is "old stuff" to Antisep. It's being used for general machine work—for automatics—for stamping and forming—for over 90% of all metal cutting operations with similar success!

You'll save space and simplify selection by using Antisep "across the board". You'll cut coolant costs, too, because you can dilute one part Antisep with as much as 30 parts of water. You'll benefit by its high anti-weld properties and its exceptional film strength.

Ask the Houghton Man to arrange a test in your plant. If you want prices or further information in the meantime, write or call E. F. Houghton & Co., Phila. 33, Pa.

ANTISEP

ALL-PURPOSE BASE

E. F. HOUGHTON & CO.

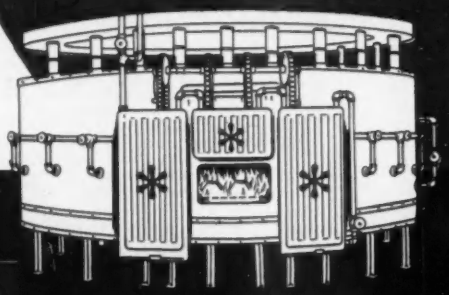
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Write for Case History booklet showing other machining examples of time and money saved with Antisep.

Ready to give you on-the-job service . . .

in the plant of a PROMINENT MOTOR CAR MANUFACTURER

PLATECOILS replace pipe coils



and improve working conditions
cut maintenance costs
save down time

The unique application of Platecoils as a heat shield for a Rotary Hearth Furnace has resulted in many cost-saving advantages for a prominent motor car manufacturer.* It is no longer necessary for operators to leave work every half hour as was formerly done. The Platecoils cool so much more efficiently than the pipe coils previously used that working conditions have been greatly improved.

Then too, the pipe coils would occasionally rust through, necessitating shut down of the entire department. Use of Platecoils has eliminated these shut-downs and effected savings of several hundred dollars yearly in maintenance costs alone. Although the original cost of Platecoils is greater, they will pay for themselves many times over in the next few years.

Whatever your tank heating or cooling requirements, Platecoils will give you greater efficiency and dependability . . . at less cost to you. Get the facts today, send for bulletin No. P74.

*Name on request

Cleaned and Repaired Without Dumping Tank Solution
Greater BTU Transfer Per Unit Area
Weighs Only Half as Much as Pipe Coil
No Threaded Joints in Tank
Increased Tank Capacity
Fast, Easy Installation
Easy to Clean

PLATECOIL
Division
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

NEW PRODUCTS

For additional information please use coupon on page 62

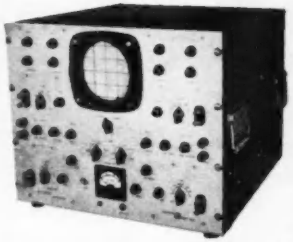
(*Continued from page 78*)

combination with other press operations such as drawing, ironing, coining and forging. Pressures required to make a steel bar flow in the cold state are surprisingly low.

In announcing the process, Mullins' engineers revealed that one of their discoveries is that they can control the flow of steel under pressure so as to direct it where they want it to go with a minimum of internal friction.

F-112—Dual-Channel Oscilloscope

A dual-channel oscilloscope featuring a flat frequency response from DC to one megacycle has been announced by the Electronic Tube Corp., Philadelphia, Pa. The use of two independent channels working into a single two-gun cathode ray tube permits high or low



Electronic dual-channel oscilloscope, model H-23.

frequency phenomena to be viewed either singly or simultaneously on a single tube face.

Designated model H-23, the vertical deflection amplifiers have capacitive and conductive input attenuators, allowing operation as either AC or DC coupled amplifiers.

Each channel is supplied with an independently operating sweep generator. Both channels may be switched to the same sweep, allowing the examination of two related phenomena on a common time base. Sweep generators are designed for either single sweep or recurrent operation.

F-113—Portable Drill

Another model of the ¼-in. Holgun drill has been announced by The Black & Decker Mfg. Co., Towson, Md. Redesigned with a new handle, the Holgun is rated for production service.

(*Turn to page 154, please*)

YOU GET ALL 3—

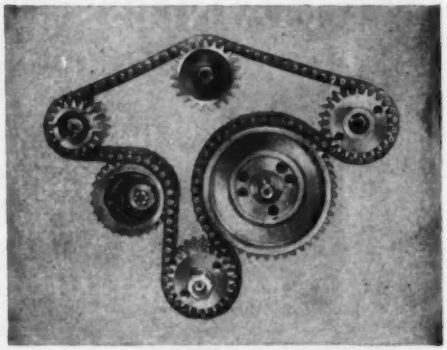
- **AUTOMATIC JOINT SNUGNESS**
- **SMOOTHER OPERATION**
- **GREATER DESIGN FLEXIBILITY**

...when you use LINK-BELT ...the world's finest timing chain from the world's largest chain plant

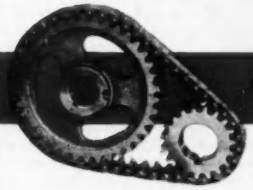
YES, you get superior performance . . . greater design flexibility when you work with Link-Belt Timing Chains and Sprockets. It's the highest load carrying chain on the market. Chains now being used by some leading car manufacturers measure only $1\frac{1}{16}$ inches in width. Narrower designs can mean a vital saving of space.

Equally important — the continuing research and unsurpassed facilities of the vast, new Link-Belt plant combine to make Link-Belt your best bet for a dependable chain source. Our engineers will supply a test drive to your specifications. There's no obligation, of course. Details are in engineering catalog No. 2065.

12.381



Link-Belt Duplex Timing Chain combines timing and accessory drive functions on this popular engine. Either face of the chain meshes with wheels.



ADVANCED JOINT AND LINK CONSTRUCTION

Removable case-hardened segmental liners or bushings extend across entire chain width —double bearing surface . . . halve bearing pressure on joint

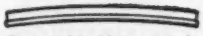
Broached holes in links form lock grip for bushings

Smooth, case-hardened pin, free to rotate between segmental bushings, presents every part of surface for wear

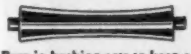
Bushing takes wear at joint—elongation of link hole or eye is negligible

AUTOMATIC JOINT SNUGNESS

After initial assembly in chain, bushings are straight

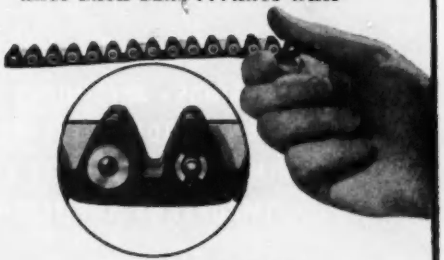


Segmental bushings are made with slight bow



Bow in bushing acts to keep a snug joint, maintaining chain pitch

ANTI-BACK-BEND . . . ANTI-WHIP



Built-in check in joint limits bushing rotation, checks back-bend and whip

LINK-BELT

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY: 220 South Belmont, Indianapolis 6, Ind.
Offices in principal cities

COOLIDGE
BALLS
CHROME ALLOY
STAINLESS STEEL

•

Finest:
ELECTRIC FURNACE STEEL
HEAT TREATMENT
LAPPED FINISHES

•

THESE FACTORS COMBINE TO MAKE THE FINEST STEEL BALLS OBTAINABLE BECAUSE THEY CONTRIBUTE TO CLOSER SURFACE UNIFORMITY—BETTER STRAIN DISTRIBUTION—HIGHER LOAD CARRYING CAPACITY—LONGER LIFE

•

Used in:
BALL BEARINGS • AUTOMOTIVE • AIRCRAFT
FARM AND INDUSTRIAL EQUIPMENT
MACHINE TOOL • OIL WELL AND OTHER
IMPORTANT APPLICATIONS

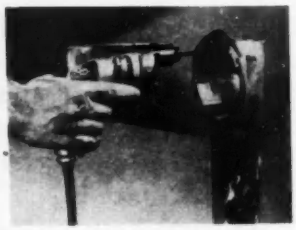
•

COOLIDGE
CORPORATION
BOX 488 • MIDDLETOWN, OHIO

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page* 152)

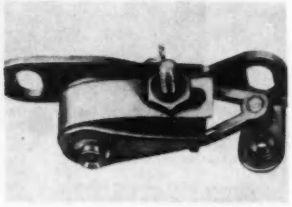


Black & Decker portable drill, the Holgun.

Among the features are full-sized ball bearings, heat-treated gears, splined gear shafts and aluminum housings. This heavy-duty drill is an end handle unit and is available for standard speed or low speed. The standard speed unit has a no-load speed of 1700 rpm (optional 2500, 3500 or 5000 rpm). While the low speed unit has a no-load rating of 600 rpm (1000 rpm optional).

Compart in design and weighing only 3¼ lb, the drill is claimed to be useful in close corner drilling and for continuous operation. It is powered with a Black & Decker universal motor and is available for 115 volt or 220 volt power lines. Standard equipment includes two-pole automatic-release trigger switch and locking pin, three-wire cable and plug, three-paw geared threaded chuck and key.

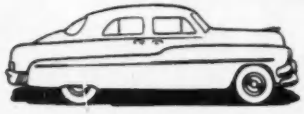
F-114—Distributor Points



The Holley Carburetor Co., Detroit, Mich., has recently made available a heavy duty breaker arm and bracket assembly. These points are used on the Model 1255 distributor which has been accepted by the White Motor Co. as original equipment on their heavy duty trucks. They are interchangeable with the points used on all Holley pressure distributors.

Heavy duty contacts are made with a vent in the center of the stationary disk to permit air to surge past the contact faces when they are opened.

(*Turn to page* 158, *please*)



SMARTENS THE INTERIOR OF THE 1951 MERCURY

Why sacrifice beauty for wearability when *you can have both* with Bur-Tex No. 186! This prize achievement in automotive trim features long-wearing plastic-coated padded felt with rich-looking Spanish or Colonial grain embossment — adding new color and lustre to car interiors. Its tough, durable surface is ideal for SEAT FACINGS, TOE HOLES, KICK PLATES, etc. Leading automotive manufacturers are using Bur-Tex No. 186 in current production.

Bur-Tex

[redacted]

Detroit office • Stephenson Building • Tr. 3-0762

Friction material problem?

R/M BELONGS IN YOUR PICTURE!

"STOP-AND-GO" IS OUR BUSINESS!

Passenger car manufacturers have long brought their brake and clutch problems to RAYBESTOS-MANHATTAN. They *know* they can count on R/M for brake linings, clutch facings, and automotive transmission friction parts for all cars of current or future design.

R/M leadership in the automotive industry is as old as the industry itself. More cars, trucks and buses use R/M friction materials than any other make.

And R/M leadership in these products takes in many other fields, from machine tools to farming equipment.

This wide variety of applications means that R/M experience can help *you* in practically any STOP-AND-GO problem. Call in your R/M representative. He can work from samples, from designs on paper, or from figures on horsepower development combined with desired performance characteristics. Behind him stand the facilities of the world's largest producers of friction materials, with six great plants . . . their research departments, and their testing laboratories.

R/M

FIRST IN FRICTION

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION **620 Fisher Bldg., Detroit 2, Mich.**

Chicago 11 **Cleveland 14** **Los Angeles 11**

Factories: Bridgeport, Conn. Manheim, Pa. Passaic, N.J. No. Charleston, S.C. Crawfordsville, Ind. Canadian Raybestos Co. Ltd., Peterborough, Ont.

RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings Fan Belts • Radiator Hose • Mechanical Rubber Products • Rubber Covered Equipment • Packings Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

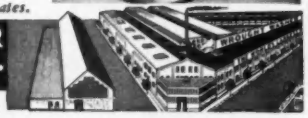
R/M

Since 1887

MILWAUKEE WROT WASHERS

Better WASHERS ... Competitively Priced

Large volume production, the most advanced methods and facilities, plus more than 60 years of continuous experience in the manufacture of Washers, are factors that enable us to offer you top quality washers and stampings at competitive costs. Over 22,000 sets of dies for making Washers of every type (Standard and Special), from every type of material, for every purpose, in any finish. STAMPINGS of all descriptions; Blanking, Forming, Drawing. *Submit your blueprints and quantity requirements for estimates.*



WROUGHT WASHER MANUFACTURING CO.
The World's Largest Producer of Washers
2212 S. BAY ST., MILWAUKEE 7, WIS.

Set Screws STAY SET on REO Power Mowers since changing to... ZIP-GRIP* Self-Locking SET SCREWS

send for FREE
ZIP-GRIP* Action Demonstrator
... and see why—

Zip-Grips* defy vibration, jolts, shocks . . . "Do Not Loosen in Normal Service", says Reo Motors, Inc., makers of "America's Biggest Selling Power Mowers".

The ZIP-GRIP* demonstrator shows you how ZIP-GRIP'S* exclusive Contra-Thrust action together with Interference Fit provides positive self-locking effect in over 100 products.

Along with your FREE ZIP-GRIP* Action Demonstrator we will send you, without cost, an illustrated Data Sheet and an offer of Engineering Test Samples to help solve puzzling set screw applications on your products. Write for these, without charge or obligation.

*PAT. PENDING

Makers of Socket and Headless SET SCREWS

Set Screw & Mfg. Co.

16 Main St. Bartlett, Ill. (Chicago suburb)

We specialize in Solving Puzzling Set Screw Problems.

NEW PRODUCTS

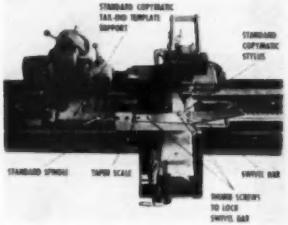
For additional information please use coupon on page 62

(*Continued from page* 154)

F-115—Lathe Attachment

Recently announced by the manufacturer is a flat template device for the Lodge & Shipley Co., Cincinnati, Ohio, Copymatic lathe for taper turning. The desired taper may be set on a direct-reading scale which is part of the attachment.

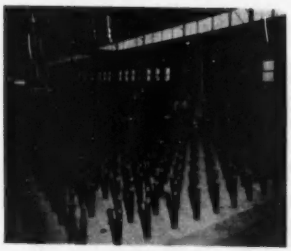
A swivel bar and scale has been incorporated in the special flat template taper arrangement on the Copymatic. The swivel bar, which is mounted on the standard tail end template support, may be angled to the desired taper.



Lodge & Shipley taper turning attachment.

F-116—Materials Handling Equipment

Ball transfers, manufactured by Mathews Conveyer Co., Ellwood City, Pa., are designed to move objects at

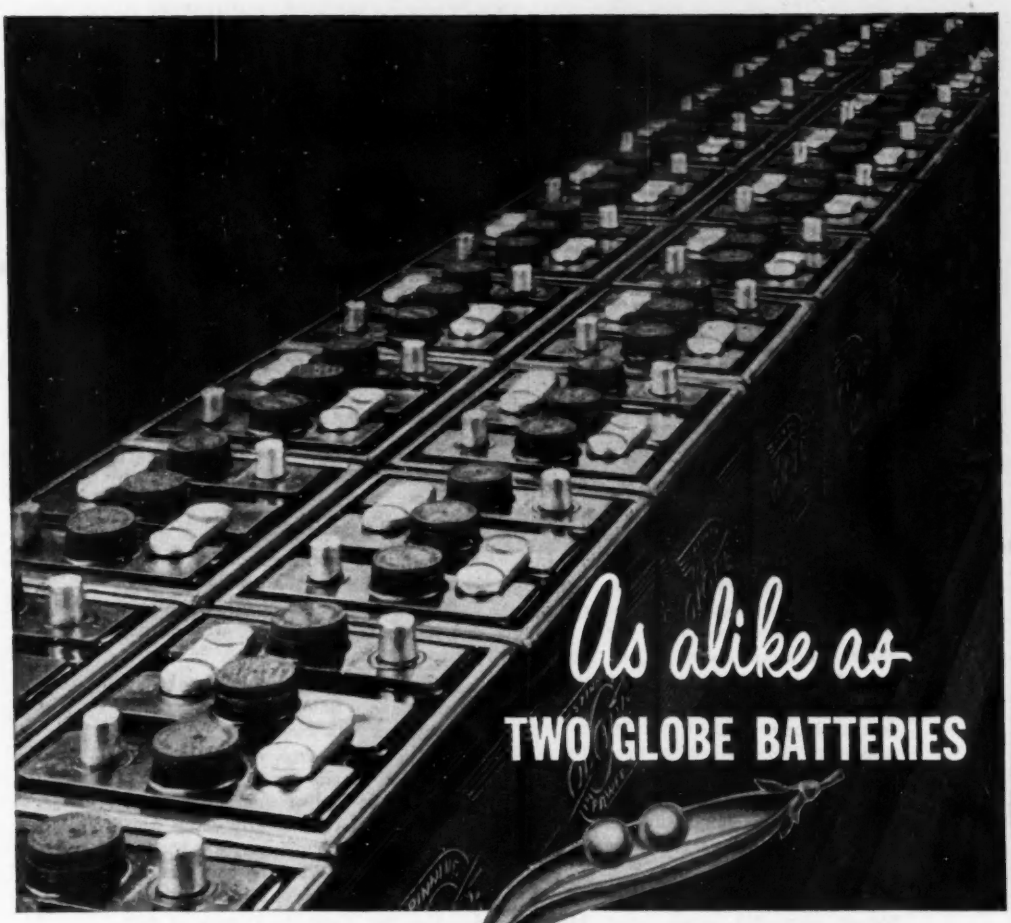


Mathews ball transfers.

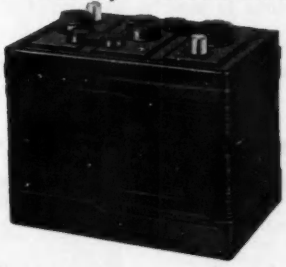
all angles. Boxes, sheets or plates can be moved to any position for cutting or other operations.

Ball transfers are available in five basic types. Types 101 (capacity 50 lb) and 201A (capacity 100 lb) are usually welded or bolted to steel plates to form a table on which materials can be moved in any direction.

(*Turn to page* 162, *please*)



CONTROL-BUILT FOR ABSOLUTE UNIFORMITY



PICK any Globe battery out of the line or off the shelf. It will be like every other Globe-Union built battery of its class, in specifications, materials, performance. Identical equipment and processes are in use at all thirteen Globe-Union factories. Standardization is complete to the smallest detail. Precision production is a fact, not a phrase. That's why, no matter what your original equipment or replacement requirements may be you can meet them better with Globe-Union built batteries.

"Spinning Power, split second starting, long life" . . . these characteristics for which Globe-Union built batteries have long been noted are dependably yours in *every* battery, size for size, type for type . . . year after year.

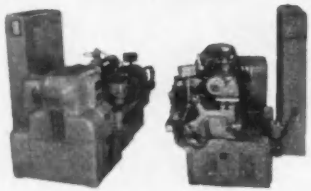
SPINNING POWER
GLOBE-UNION
SPLIT-SECOND STARTING

GLOBE-UNION, INC., Milwaukee 1, Wisconsin

Battery Production Plants At:

Atlanta, Ga. • Boston, Mass. • Cincinnati, Ohio • Dallas, Texas • Emporia, Kans. • Hastings-on-Hudson, N. Y.
Los Angeles, Calif. • Memphis, Tenn. • Mineral Ridge, Ohio • Oregon City, Ore. • Philadelphia, Pa. • Reidsville, N. C.

6 Men



+12 Mona-Matics

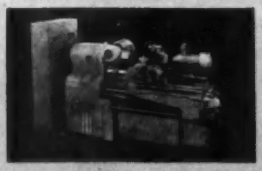
= Savings for Studebaker of 25c per car!

Here's the way Studebaker Corporation cuts costs with Mona-Matics. First, they installed 12 of these high speed, automatic cycle lathes, for operation by 6 men. With these machines they get 6 steering knuckles put on the floor every 68 seconds, with stem end turned complete including face of flange—PLUS 6 steering knuckle pins every 73 seconds, with pin end turned complete. Rough grinding is eliminated in both cases. Day after day, on reductions in actual machining time alone, these twin Mona-Matic operations save Studebaker 25c per car!

And there's even more to the story. Tracer controlled single point Mona-Matic turning delivers other important production advantages almost equaling, in dollars, the original savings in machining. When you take quicker turning time—add savings in subsequent grinding operations—and then add further savings in tools, tool sharpening and tool change time—you see how Mona-Matics can justify themselves cost-wise on any production line.

How about performance? Auto makers, as concerned with uninterrupted production as they are with costs, rely on Mona-Matics for *unfailing, long-run, high speed automatic cycle turning.* Yet another advantage of this versatile machine is its typically shorter setup time, rarely exceeding 30 minutes, as in the jobs illustrated here. Whether you are concerned with long runs or short ones, you'll find that the Mona-Matic pays its way. Let us send you complete information . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

FOR A GOOD TURN FASTER • • • TURN TO MONARCH



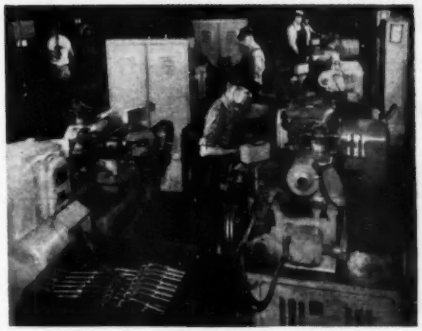
THE MONA-MATIC is a powerful high speed machine suitable for both first and second operation work. Multiple diameters, tapers, faces, radii and chamfers are turned by the single Air-Gage Tracer controlled cutting tool on front carriage. Template contours are reproduced generally to accuracies of + or −.001″ with a smooth, stepless finish because of continuous, single tool cut. Tools on rear slide perform necking, grooving and forming cuts. Set-up time is always less. Tool investment and tool sharpening time hit a new low. And the "Air-Gage Tracer" guided cutting tool often reduces the amount of grinding stock by more than half or eliminates the grinding operation entirely.

MONA-MATIC WITH MAGAZINE LOADING

This is an automatic lathe (left) in every sense of the word. It goes through the machining cycle automatically; unloads and loads automatically with no more attention required than keeping the magazine filled with work pieces. Cost per piece is tremendously reduced because this permits an operator to handle a battery of such machines.

Tooling is similar to the basic Mona-Matic excepting that the loading magazine takes the place of the regular rear carriage. Recommended for short multiple diameter work having a maximum diameter of no more than 2″.

Above—Part of the steering knuckle line. Automatic speed change, an exclusive Mona-Matic feature, accounts for maximum cutting tool efficiency and extended tool life. Work speed is halved as tool starts out along face of flange.



Left—The steering knuckle pin line. Another Mona-Matic exclusive, the automatic feed change, permits use of four different feeds during the cut. Results—greater accuracy, overall and longer tool life.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: Please send without obligation your illustrated Booklet No. 1804-1 giving complete information on the Monarch Mona-Matic.

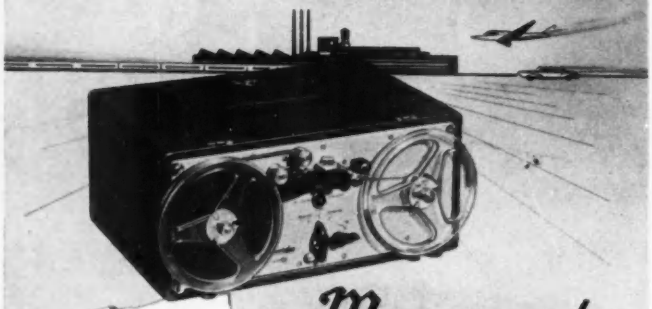
NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

"SOUND" Research for a Better Product



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The high fidelity Magnecorder lets you hear great music and history-making broadcasts as they should be heard—with all the true brilliance of "living sound." The First Choice of Radio Engineers Everywhere!

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Professional Tape Recording Equipment for Every Industrial Need

NOISE ANALYSIS • PROCESS CONTROL
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HOLLEY DISCOVERS HOW TO SPARK A CARBURETOR IMPROVEMENT WITH

ACE
PRECISION
NYLON BALLS

Holley Carburetor Co., Detroit, uses Ace Nylon Balls as check valves in carburetors to permit a higher degree of spark advance.

For the first time . . . DuPont Nylon FM #10001 balls mass-produced to close tolerances. The result . . . toughness at low temperatures, form stability at high temperatures, light weight, chemical and abrasion resistance.

Hundreds of Industrial Applications! Let our engineers advise you.

Request samples and bulletin TODAY

SIZES 1/8"—3/4"
TOLERANCES ± .001

ACE PLASTIC COMPANY
Precision Plastic Fabricators and Extruders

91-46 VAN WYCK BLVD. • JAMAICA 2, N. Y.

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page* 158)

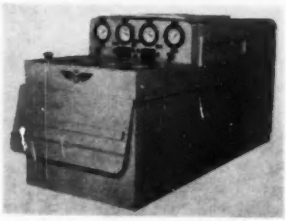
Types 202A (capacity 100 lb), 501 (capacity 250 lb) and 750 (capacity 650 lb) are usually threaded onto the end of pipe mountings. This method is claimed to be ideal for handling plates or sheets around punches, presses and shears. While pipe mounting is the most common use of types 202A, 501 and 750, they can also be welded or bolted to plates for handling the blocks and similar heavy loads.

F-117—Welding Alloy

Development of "EutecTrode 70" for chrome-moly steel has been announced by Eutectic Welding Alloys Corp., Flushing, N. Y. It is a chrome-and-nickel content electrode coated with Eutectic's "FrigidArc." Other features are said to include high tensile strength plus an unusually low amperage application.

EutecTrode 70 is manufactured in the following sizes: 1/16 in., 5/64 in., 3/32 in., ⅛ in., 5/32 in., and 3/16 in. diam.

F-118—Service Machine



Greer Hydraulics, Inc., Brooklyn, N. Y., has announced the addition of a lubrication system service machine to its line. The unit, model OR-100, is suited for three different applications, namely: the cleaning, flushing and pre-oiling of jet and reciprocating engines and component parts of the lubrication system removed from storage or stock; the servicing of lubrication systems; and the pre-heating of oil to facilitate engine starting in sub-zero temperatures. While designed for cleaning and pre-oiling of stored engines and components, it is also possible to reverse the procedure and use the machine to prepare engines and components for storage.

The OR-100 consists of two completely self-contained systems each of which is provided with a reservoir, a pump and motor, a filter and interconnected internal manifolds. Each reservoir is provided with high capacity immersion type electrical heaters.

From Bumper to Tailgate . . .

N-A-X
HIGH-TENSILE STEEL

Reduces Deadweight and Increases Durability

The widespread use of N-A-X HIGH-TENSILE steel in transportation equipment emphasizes two vital characteristics of this high-strength low-alloy steel.

1. *Strength with less deadweight.* N-A-X HIGH-TENSILE steel reduces deadweight . . . of great importance in transportation equipment and military vehicles.
2. *Exceptional durability.* N-A-X HIGH-TENSILE steel, with its high strength and toughness, has proved greater resistance to fatigue and impact at normal and sub-zero temperatures. Its inherent structure and composition greatly reduce the effects of abrasion and corrosion.

The response of N-A-X HIGH-TENSILE steel to severe cold-forming operations and its excellent weldability by electric arc or resistance, atomic hydrogen or heliarc, and all other processes, are added important characteristics of N-A-X HIGH-TENSILE steel.

The "Eager Beaver"

The use of low-alloy, high-strength steels in military equipment assures longer life with less deadweight.

GREAT LAKES STEEL CORPORATION
N-A-X Alloy Division • Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION

IMPORTANT

precision production

For more than 35 years The Pierce Governor Company, Inc. of Anderson, Indiana, has excelled in the design, engineering, and production of important parts for the Automotive and Aircraft industries. Today's production features:

Sisson Automatic Chokes

Complete line of precision engineered chokes for the automotive industry—original equipment and replacement parts

Famous Pierce Governors

Pierce centrifugal-mechanical and hydra-mechanical governors for gas, gasoline and Diesel engines—automotive and industrial.

Aircraft Engine Controls

Design and manufacture of precision hydraulic and mechanical fuel control systems for leading aircraft engines

Hydraulic Transmission Controls

Manufacture of control mechanisms for hydraulic transmissions

Let Pierce's precision engineered products and manufacturing facilities solve *your problem!* Write . . .

The Pierce Governor Co., Inc.
Anderson, Indiana

PIERCE GOVERNORS

Industry News

(*Continued from page* 23)

Higher Car Exports Reduce Home Supply

With the number of new cars to be produced this year considerably below the high level of 1950, the reduced number of passenger cars available for the domestic market is being cut even more by the sharp upturn in exports from last year. Through September of this year, 214,878 passenger cars went to the export market, compared with 109,459 for the same period last year, an increase of 105,419 or more than 96 per cent. As a result of the drop in production and the increase in exports there were available for the domestic market through September, 4,058,225 cars or 821,194 fewer than the same date a year ago.

The truck situation is somewhat different, even though exports also increased this year. Through September, export of motor trucks totaled 170,859 or 65,798 units more than at the same time a year ago. Production, however, was 1,128,182 units or 122,182 more than the same date a year ago. As a result, at the end of nine months there were 957,323 trucks available for the domestic market or 56,384 more than at the same time last year.

Deluxe Models Gain In Buyer Preference

Although some critics of the automotive industry contend that the public wants plain automobiles without chrome trim and other refinements, the record shows that the deluxe models are the best sellers. During the past few months the percentage of deluxe models, as compared to the less elaborate standard type, has increased considerably, and it is estimated that in the current quarter will average better than 80 per cent. Preferences for deluxe models indicates that the market still is sound, since one of the first signs of a soft market is a falling off in popularity of the higher-priced models.

Fleischmann to Head Speakers at Maintenance Conference

A 56-speaker panel for the discussion of plant maintenance problems will be headed by Manly Fleischmann, administrator, Defense Production Administration, at the Plant Maintenance Conference, Philadelphia, Pa., Jan. 14 to 17.

The conference, sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management, will be held in conjunction with the Plant Mainte-

(*Turn to page* 166, *please*)

Aetna

TO SAVE MAN HOURS, MACHINE HOURS AND MONEY

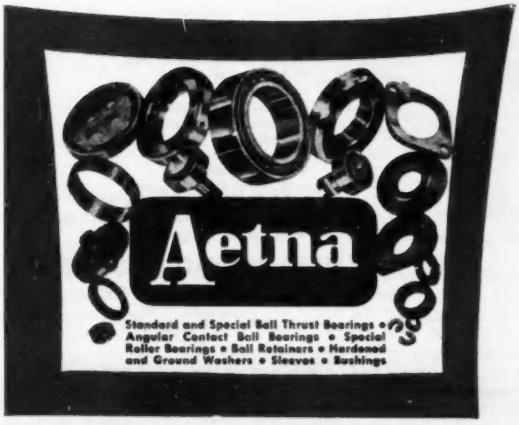
TO HELP GET THINGS DONE

Today the pressure for production is on. The welfare of our economy —or of an individual business—may depend upon a deeper search for time and money-saving methods.

Take your own plant, for example. Maybe there's a lot you could save—some bottlenecks you could break—by letting Aetna fabricate certain of your assembly parts . . . to your most exacting metallurgical, uniformity and tolerance specifications. You'll avoid troublesome raw material procurement problems, decrease the burden on over-loaded equipment, save man-hours and very likely reduce the delivered cost of your product to boot.

Aetna's mobilized facilities include the most modern equipment for stamping, piercing, machining, heat treating, ultra precision finish grinding plus complete engineering assistance, extensive tool and die facilities and over 35 years experience in serving leading manufacturers in the Automotive, Agricultural Equipment, Oil Field Equipment and General Industrial Fields.

NOW is a good time for YOU to find out how Aetna can help with your parts problems as well as your bearing problems. Write today!

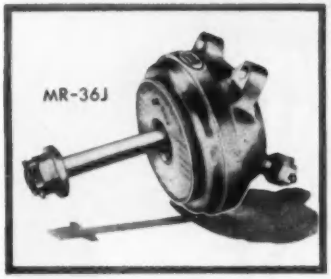

Aetna
Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings

AETNA BALL AND ROLLER BEARING COMPANY
4600 Schubert Avenue, Chicago 39, Illinois

In Detroit: SAM T. KELLER • 2457 Woodward Avenue

Increase Payload

20 lbs. for Convair 240
40 lbs. for Douglas DC-6



LORD DYNAFOCAL REWORK PLAN

Here is an opportunity for operators of 240's and DC-6's to add extra payload capacity by reducing gross weight.

Many of these airplanes were built before LORD developed the lightweight MR-36J Dynafocal which saves ten pounds of weight per engine mounting assembly. The LORD rework plan enables operators to return genuine LORD MR-36F Dynafocals to the factory for rework into the lighter MR-36J design. All parts receive 100% inspection . . . new rubber is bonded into cores . . . various metal parts are machined to new contours . . . and components showing undue wear are replaced with new ones.

Thus—at a fraction of the cost of new mountings—you receive factory rebuilt Dynafocals which incorporate the latest LORD design features. The weight is reduced to 30.5 pounds per assembly without sacrifice of strength or performance. Write to the attention of Product and Sales Engineering Department for specific information.

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

LORD
BONDED RUBBER

Vibration-Control Mountings . . . Bonded-Rubber Parts

Industry News

(*Continued from page* 164)

nance Show, which expects 225 exhibitors and 14,000 visitors.

The conference will be divided into more than 30 separate sections to accommodate special talks on individual industry needs and problems. Industries scheduled for separate coverage include: chemical plants, metal producing, metal working, aircraft, etc.

Reo Motors Earnings Rise Sharply

Reo Motors earnings for the first nine months 1951 totaled $1,799,983, more than triple the $595,952 earned in the same period a year ago. Sales for the nine months of this year were more than $77 million, compared with $29.4 million for the same period in 1950.

Buick Builds Two Millionth Car Since End of War

GM's Buick Motor Div. built its two millionth car since World War II recently and marked a total production of 6,381,433 cars since 1903, according to Ivan L. Wiles, Buick general manager and GM vice president. More than half of the two million have been equipped with Dynaflow drive.

Many U.S. Cars Entered In Mexican Contest

The Second Mexican Pan-American Race, to be held in Mexico City Nov. 20 to 25, promises to be one of the most important international automobile speed competitions of the year. A large number of U. S. cars and several foreign types will compete for the $68,380 in prize money.

Elect O'Neill to Head AAA

Former senior vice-president J. E. O'Neill was elected by the American Automobile Association to succeed Lou E. Holland as president of the organization at the final session of its annual convention in Washington, recently. The AAA also named Ralph Thomas as senior vice president and John A. Rupp as secretary.

Correct Titles

In the article, "Renegotiation Needs Salesmanship," which was published in the October 15 issue of AUTOMOTIVE INDUSTRIES, the correct titles of Robert Sommerville and W. P. Logan of the Electric Storage Battery Co. are Assistant General Sales Manager and Staff Assistant to the Vice President in Charge of Sales, respectively.

(*Turn to page* 168, *please*)

Aircraft designers have been specifying LORD Mountings for over a quarter of a century. There are sound reasons for such continued preference. LORD pioneered the shear type bonded-rubber mounting which opened the door to scientific isolation of vibration, and developed the world's most complete line of such mountings. A continuous program of research is maintained to make LORD Mountings the most effective . . . most dependable . . . most economical mountings obtainable. Designers appreciate the thorough training and cooperative attitude of the LORD engineers who help them find practical answers to their vibration problems.

Look For LORD Mountings Here . . .

- Reciprocating Engine Mounts
- Turbojet Engine Mounts
- Turboprop Engine Mounts
- Engine Shipping Containers
- Instrument Panels
- Radio Equipment
- Radar Equipment
- Cameras
- Actuator Attachments
- Engine-Generator Sets
- Navigator Tables
- V.H.F. Antennae
- Helicopter Engine Mounts
- Helicopter Rotors
- Helicopter Drive Shafts
- Engine Cowls
- Pilot Seats
- Control Cable Pivots
- Hydraulic Pressure Switches
- Control-Surface Travel Limiters
- Intercom Equipment

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

LORD
BONDED RUBBER

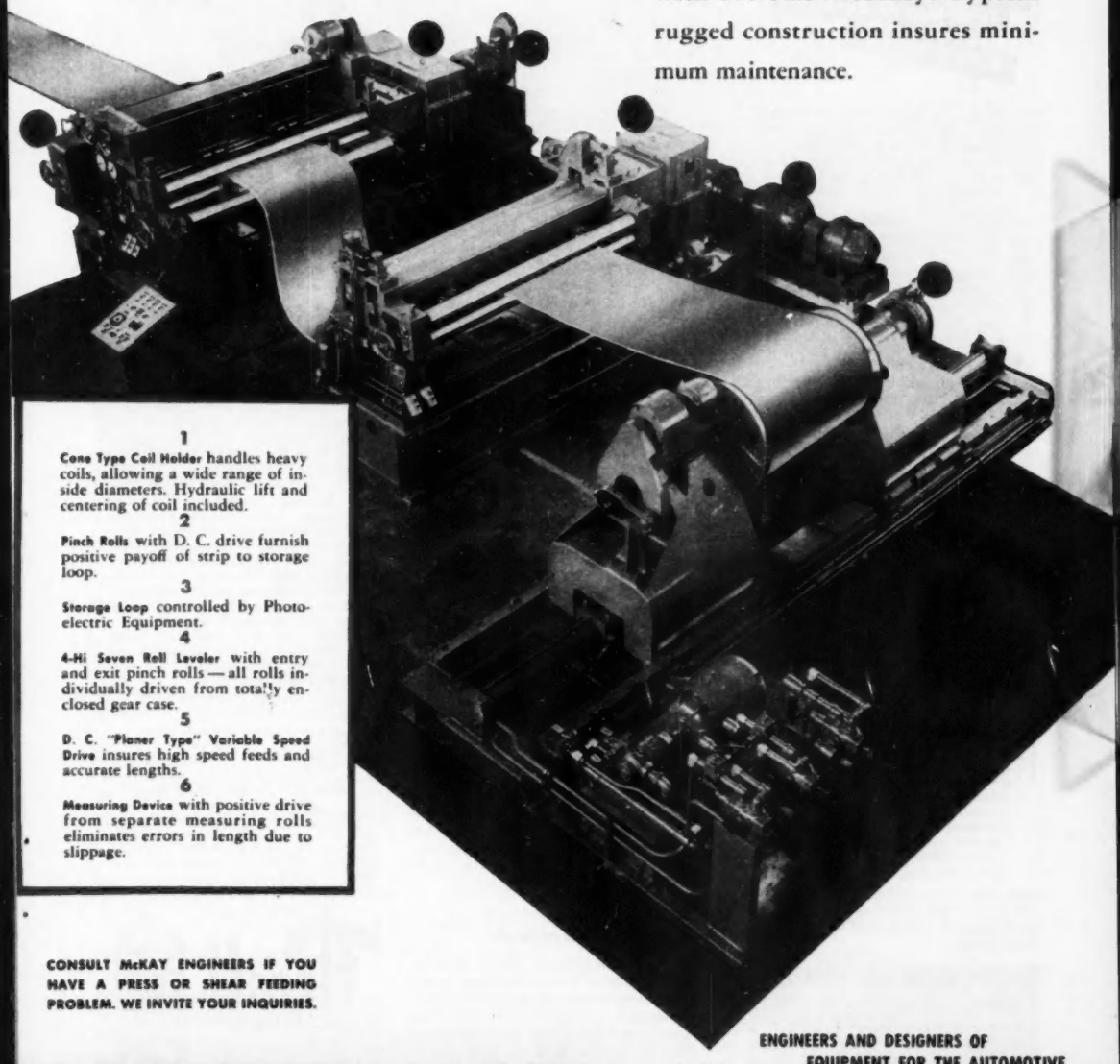
Vibration-Control Mountings . . . Bonded-Rubber Parts

McKAY

PRESS FEED AND CUT-UP LINE

A New Answer to COIL FEEDING *Problems*

Incorporating the latest in D.C. drive and control, McKay's *new* feeding line provides high production with extreme accuracy. Typical rugged construction insures minimum maintenance.



1
Cone Type Coil Holder handles heavy coils, allowing a wide range of inside diameters. Hydraulic lift and centering of coil included.

2
Pinch Rolls with D. C. drive furnish positive payoff of strip to storage loop.

3
Storage Loop controlled by Photoelectric Equipment.

4
4-Hi Seven Roll Leveler with entry and exit pinch rolls — all rolls individually driven from totally enclosed gear case.

5
D. C. "Planer Type" Variable Speed Drive insures high speed feeds and accurate lengths.

6
Measuring Device with positive drive from separate measuring rolls eliminates errors in length due to slippage.

CONSULT McKAY ENGINEERS IF YOU HAVE A PRESS OR SHEAR FEEDING PROBLEM. WE INVITE YOUR INQUIRIES.

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

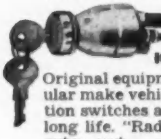
The **McKAY MACHINE** *Company*

YOUNGSTOWN, OHIO

DEPEND ON
Mitchell
FOR THESE
SPECIALIZED
PRODUCTS

Ignition Switches
Turn Signal Switches
Rolled Shapes

Widely used by leading builders of cars, trucks, buses and tractors, Mitchell ignition switches, turn signal switches and rolled shapes meet the most exacting specifications of the automotive industry.

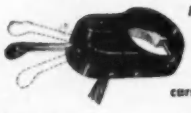


AUTOMOTIVE IGNITION SWITCHES

Original equipment on many popular make vehicles, Mitchell ignition switches are noted for extra long life. "Radio" position at no extra cost.

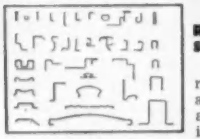
TURN SIGNAL SWITCHES

Semi- automatic, self-cancelling. Afford drivers easy, positive way to indicate turns to approaching and following traffic as well as to pedestrians.



Mitchell clamp-on and screw-type semi-automatic turn signal switch for trucks, cars, buses, tractors.

Mitchell 6-wire concentric-type semi-automatic turn signal switch used in passenger cars.



ROLLED SHAPES

Complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper—cold rolled, drawn and pressed—for automobiles, airplanes, railroad cars, architectural requirements, radios, television receivers, all industrial uses.

Our sales engineers work with you in the application of Mitchell products to your specific designs. Call on us at any time.

UNITED SPECIALTIES COMPANY
Mitchell Division, Philadelphia 36
Ignition and Turn Signal Switches • Rolled Shapes • Dovetails
UNITED AIR CLEANER DIVISION
CHICAGO 28
Air Cleaners • Metal Stampings

Industry News

(*Continued from page* 166)

Bureau Permanent Discusses Automotive Problems

At a recent meeting of the Bureau Permanent in Paris, at which all European nations except Czechoslavakia were represented, several important problems were discussed. First of all, the question of weight rating was taken under consideration, and in all probability manufacturers will be requested to attach a weight tag to their trucks.

Secondly, although it has become standard practice in many European countries to use a supplementary electric or compressed air brake on heavy vehicles, it was decided that developments now in progress prevent drawing up of regulations regarding their use at the present time.

Thirdly, an international get-together movement among truck manufacturers, which began this year when British producers invited French manufacturers to visit their factories, will be continued. A gathering will probably take place in Italy in April, 1952, and Germany intends to invite foreign manufacturers in 1953.

Italy Makes Strides in Production and Export

Italian vehicle production for the first nine months of 1951 reached 115,236. This total included: 94,601 passenger cars, 19,300 trucks of all types, and 1335 buses and coaches. Although passenger car and truck production was up considerably, there was a decrease in the production of buses and coaches. Italy exported 20.8 per cent of her total production, an increase of approximately 64 per cent over the corresponding 1950 period.

French Vehicle Production Soars Appreciably

Vehicle production reported for the first eight months of 1951 indicates that France may well attain a record figure of 450,000 for the entire year. The total for the eight months included: 200,478 passenger cars, 80,530 trucks, 1,804 buses and coaches and 141 special vehicles, such as fire engines, road cleaners, etc.

Defense Contract Guide Available

A booklet entitled *Six Steps in Selling to the Armed Forces* has been issued by the Government as a concise guide for companies interested in obtaining defense contracts and subcontracts. Copies are available from Department of Manufacture, U. S. Chamber of Commerce, Washington 6, D. C., at $.15 each.

Help Lower Unit Production Cost to Meet Competition Profitably . . .

Simplified screw driving, bolt setting and nut running mean lower unit cost. This is possible with Pheoll products because they are inspected through all manufacturing steps from coil wire or bar stock to the finished product.

All threads, whether rolled or cut, are carefully gauged to American Standards. Screw and bolt heads are formed, slotted or recessed to meet rigid engineering requirements. Overall quality of the finished product is uniformly high. Precision head formation on all bolts as well as engineered slots and recesses in all screws means less wrench and driver slippage.

Pheoll engineers will recommend the correct type, size and finish of standard or special screws, bolts and nuts for your needs.

WHAT PHEOLL INDUSTRIAL FASTENERS MEAN TO YOU	CHECK THESE PHEOLL PRODUCTS FOR YOUR NEEDS
• Simpler and speedier assemblies.	☐ Machine Screws
• Less worker fatigue — more units.	☐ Sems
• Improved product appearance.	☐ Tapping Screws
• Added latitude in product design.	☐ Square Head Set Screws
• Immediate and dependable source for standardized, interchangeable screws, bolts and nuts especially suited to mass production.	☐ Threaded Cutting Screws
	☐ Cap Screws
	☐ Phillips Recessed Head Screws
	☐ Machine Bolts
	☐ Wing Nuts
	☐ Knurled Nuts

Write for literature

Pheoll
MANUFACTURING COMPANY
5700 ROOSEVELT ROAD
CHICAGO 50, ILLINOIS
SCREWS • BOLTS • NUTS
Industrial Fasteners and Holding Devices

You can count on Thompson

TO HELP KEEP CARS ON THE ROAD

For 35 years the engineers at Thompson's Detroit Plant have been working hand in hand with manufacturers to make steering safer.

Its modern plant, located in the heart of the Motor City, has been built by these years of research, experience and manufacturing know-how Today, Thompson is the world's largest producer of steering linkage.

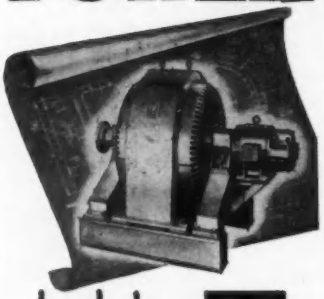
All this is back of Thompson's offer to aid car builders in solving steering problems—back of its ability to supply top-quality parts.

If you build cars or trucks, call on Thompson Products, Inc., 7881 Conant Avenue, Detroit, Michigan. Phone: WA 1-5010.

Thompson Products, Inc.

DETROIT DIVISION

for
custom-engineered
POWER



look to... EP

Since 1909, the job of The Electric Products Company has been to create and develop special electrical rotating equipment . . . motors and generators to do existing jobs better or to reach into new fields to do jobs that couldn't be done before. The natural "by-product" of our more than 40 years of specialization is that you get equipment designed and built to the exact requirements of your application . . . equipment that has greater dependability, longer life and that requires less maintenance.

Send in the coupon below for detailed information about our Custom-Engineered synchronous motors and generators . . . d-c motors and generators . . . induction motors . . . battery chargers . . . frequency changers.

A nation-wide sales engineering and service organization stands ready to meet all User requirements.

THE ELECTRIC
PRODUCTS COMPANY

17250 CLARKSTONE ROAD
CLEVELAND 12, OHIO

Attach coupon to your letterhead for your copy of Bulletin 2-200.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____
X-76

MEN *in the* NEWS

(*Continued from page* 25)

Lear, Inc.—**A. G. Handschumacher** has been appointed general manager of the Grand Rapids Div., while **W. Dawkins Espy** and **A. H. Endlekofer** have been named chief engineer and works manager, respectively. **A. N. Lawrence** has been placed in charge of the Contract Div. at Grand Rapids. **George K. Otis** has assumed the post of general manager of the LearCal Div. **Richard H. Stewart** has been named quality control manager of Lear, Inc.

American Helicopter Co., Inc. — **Joseph A. Geisler** has been appointed vice president in charge of manufacturing.

North American Aviation, Inc.— **Ralph H. Rudd** has been promoted to manufacturing manager.

Garrett Corp.—**Kenneth E. Allen** has joined the company as publicity manager.

Reliance Electric & Engineering Co., Ivanhoe Div.—**Karl H. Meyer** has been appointed manager.

Boeing Airplane Co.—**V. F. Knutzen** has been appointed assistant controller for the Seattle Div. **Kingdon Dunham** has been appointed supervisor of stores and reclamation.

Greene Manufacturing Co. — **E. H. Rocks** has been named vice president.

Thermoid Co.—**Eric O. Ridgway** has been appointed director of research and development.

Revere Copper and Brass, Inc. — **James J. Russell** has been elected chairman of the board of directors and chief executive officer. **James M. Kennedy** has been chosen president to succeed him. **C. Donald Dallas**, retired chairman of the board, continues as a member.

Lincoln Engineering Co. — **M. L. Meikle** has been elected president of the company's California Corp.

Clearing Machine Corp.—**A. J. Wilhelm** has been selected as vice president in charge of manufacturing.

Hiller Helicopters—**Bernard W. Ford** has been appointed a member of the board of directors.

Townsend Co.—**E. H. Stau** has been named sales manager of a newly-created Pacific Div.

American-LaFrance-Foamite Corp.— **George R. Hanks** has been elected president and **W. M. Price** executive vice president. **Alexander G. Long** has been named vice president in charge of manufacturing.

General Motors Corp., New Departure Div.—**Charles D. McCall** has been appointed general sales manager, suc-

(*Turn to page* 172, *please*)

PAGE
WIRE

LOW CARBON
HIGH CARBON
STAINLESS
SPECIAL ALLOY
ARMCO IRON

You draw the Shape —Page can draw the Wire

--the way you want it for your production—whether it's ALL of your product, or only a part.
Cross-sectional areas up to .250" square; widths to ⅜"; width-to-thickness ratio not exceeding 6 to 1.

for Wire or Information about Wire—

Get in touch with Page!

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

HOLLEY MATCHED FUEL AND IGNITION PARTS ORIGINAL EQUIPMENT ON WHITE 3000 MODELS

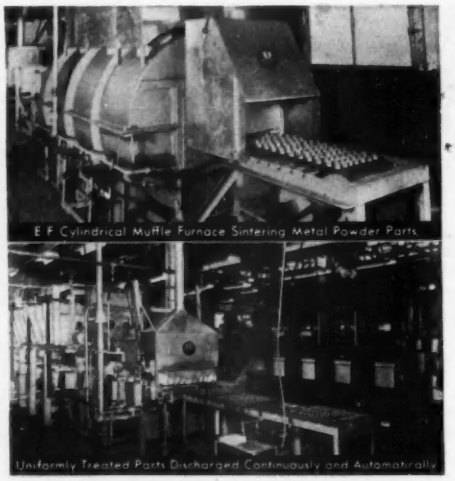
White 3000 series tractors have built an excellent reputation on their cost-per-mile operation record. One important contributing factor: the Holley carburetor-pressure distributor-governor combination. This fuel and ignition combination was designed, engineered, and produced by Holley.

FOR MORE THAN HALF A CENTURY—
ORIGINAL EQUIPMENT MANUFACTURERS
FOR THE AUTOMOTIVE INDUSTRY

HOLLEY
Carburetor Co.
DETROIT 4

EF

FURNACES for processing metal powder products



E F Cylindrical Muffle Furnace Sintering Metal Powder Parts

Uniformly Treated Parts Discharged Continuously and Automatically

Send for Descriptive Literature

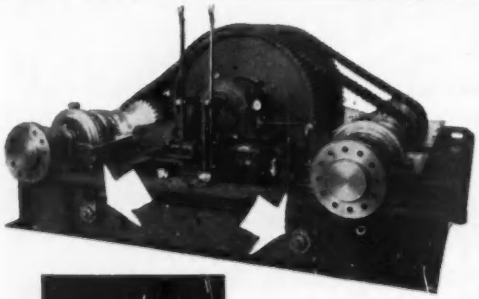
● EF furnaces are built in many sizes and types for sintering a wide variety of ferrous and non-ferrous pressed metal powder products — for bonding metal powder to strip, and other processes.

With our long experience and complete manufacturing facilities we are in position to build the size and type to fit *your* specific requirements.

EF

Gas-Fired, Oil-Fired and Electric Furnaces
for any Process, Product or Production

THE ELECTRIC FURNACE CO.
WILSON ST. at PENNA. R. R. Salem - Ohio



SOLVED...

The Problem of Driving the Pump from a Reversing Shaft

Tuthill Model R automatic reversing pumps are the answer when it is necessary to drive the pump from a reversing shaft. Model R delivers from the same port regardless of shaft rotation. Applications include lubrication, coolant and liquid transfer service. Capacities to 200 g.p.m. and pressures to 100 p.s.i. Write for Model R bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street, Chicago 19, Illinois

AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries

MEN *in the* NEWS

(*Continued from page* 170)

ceeding **Frank J. Miller**, retired. **Howard A. Offers** has been named assistant general sales manager.

Morton Machine Works—**Floyd E. Mengel** has been appointed general manager in charge of sales and manufacturing. **Eric Butterworth** has been selected for the post of manufacturing superintendent.

AiResearch Manufacturing Co. — **Claude N. Monson** has been named manager.

Lockheed Aircraft Corp.—**Fred Trygg** has been named plant manager, and **Howard Hahne** production foreman at the new Bakersfield, Calif., sub-assembly plant.

Allis-Chalmers Manufacturing Co.—The electrical and mechanical power departments have been combined into a power department under the management of **R. M. Casper.** Other new power department appointments are: **F. W. Bush**, assistant manager in charge of the electrical sections; **C. C. Jordan**, assistant manager in charge of the mechanical sections; **R. N. Miers**, manager of the steam turbine section; **C. R. Braun**, assistant to R. M. Casper; and **E. J. Schiebenes**, office manager of the power department.

The White Motor Co., Sterling Div.—**Roderick H. Clarke** has been appointed sales manager.

United States Steel Co.—**Robert M. Lloyd** has been elected vice-president—raw materials.

Howell Electric Motors Co.—**James F. Murphy** has been appointed vice-president in charge of sales.

General Motors Corp., Aeroproducts Div.—The appointment of **Don Young** as service manager has been announced.

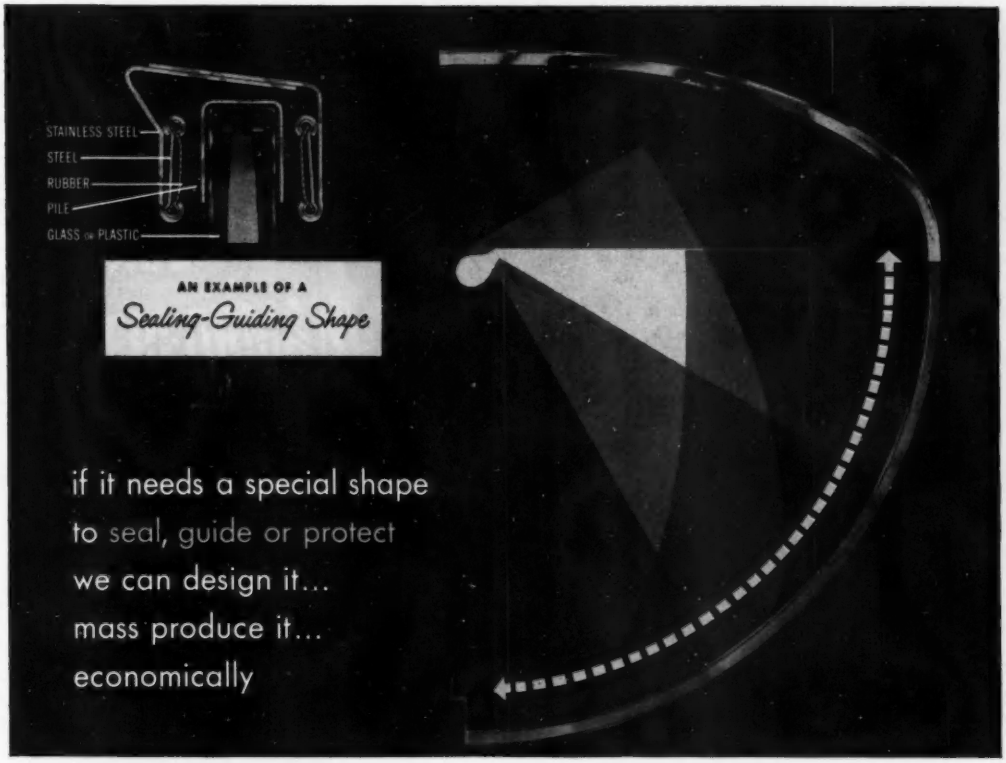
Rigidized Metals Corp. — **James F. Murray** has been elected a director.

Piasecki Helicopter Corp. — **John N. Eustis** has joined the company as subcontracts manager.

Gorham Tool Co.—**Rudolph J. Lesnik** has been appointed chief engineer.

Rockwell Tools, Inc. — **Samuel P. Owen** has been named advertising manager.

United States Rubber Co., Tire Div.—The appointment of **George M. McTavish** as manager of the government department has been announced.

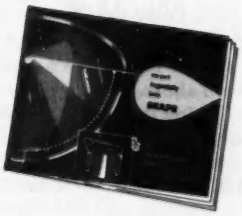


This hard-top glass run assembly demonstrates the kind of solution we can come up with for you. We put ingenuity into this assembly of shapes so that it provides an excellent seal while guiding window action smoothly and certainly. And it enhances the car's appearance.

Your problem may well be different; that's the kind we like to work on. We've helped solve so many different problems that we're now the world's biggest producer of glass run channel and weatherstrip.

Whether the problem you're wrestling with is a hard-top assembly, intricate cloth-covered convertible weatherstrip, glass run window channel or windshield rubber—we can design a shape to meet your need. We can mass-produce it at low cost—in metal, rubber, plastic or fabric. And we can bond together any combination of them, by means of unique processes we've developed.

Why not let us work with you on your next problem, right from the initial stage? In the meantime, let us send you a copy of our latest booklet, "We Put Ingenuity into SHAPE".

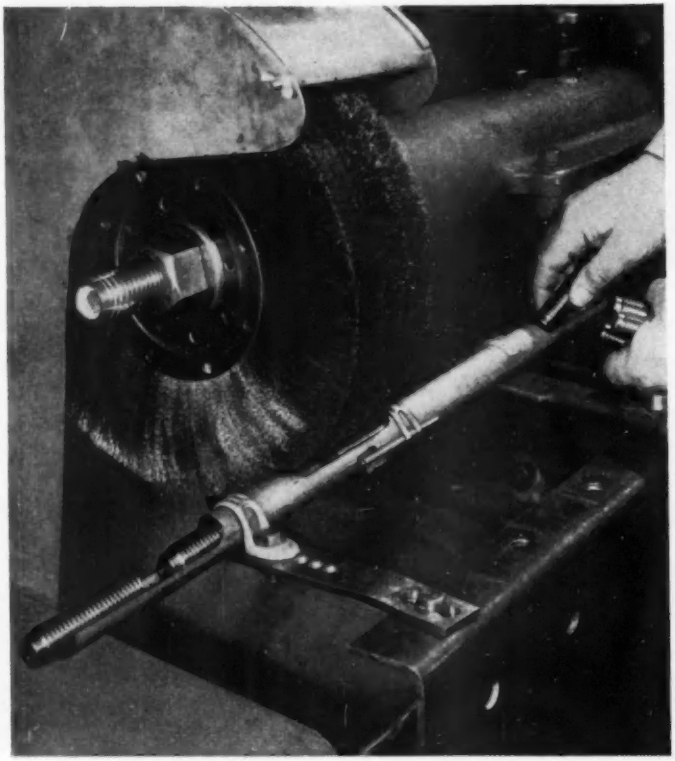


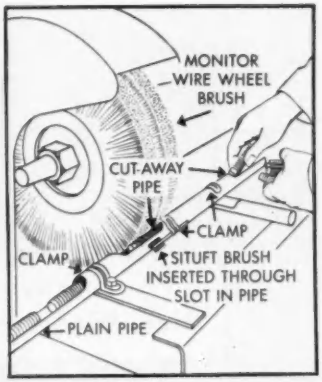
THE MARK OF A SUPERIOR PRODUCT

The Standard Products Co.

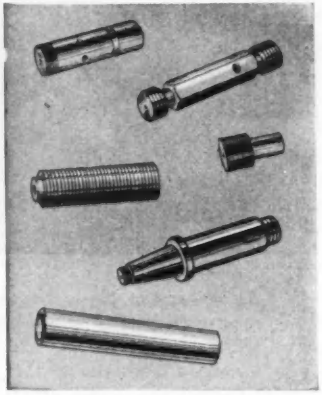
DEPT. G. GENERAL OFFICES: 2130 WEST 110 STREET • CLEVELAND 2, OHIO

WE PUT INGENUITY INTO SHAPE





THE FIXTURE. This sketch shows how to make pipe fixture for deburring and polishing small parts, threaded or smooth. Can be made of steel, fiber or plastic tubing.



TYPICAL PARTS. Set screws, pins, pieces of tubing and other parts such as these can be cleaned and finished in the pipe fixture or in the forceps shown below.

How to find an 800% production increase in a piece of pipe

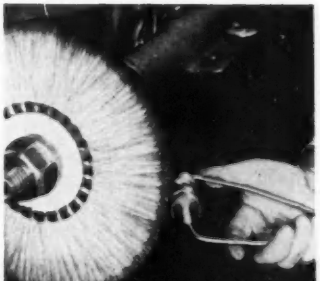
You can save manpower and money in countless ways when you tap the idea resources of power brushing. For example:

It took 18 seconds to clean the threads of the 2½ x ¾-inch set screws shown above. Time was cut to 2 seconds with Osborn Power Brushing by divising the simple pipe fixture shown. The operator feeds the screws in one end of the pipe and an Osborn brush makes contact with the work at a slot cut in the pipe, spinning and cleaning the threads uniformly. A little stationary wire brush, inserted as shown through the pipe, controls rotation and traverse of the work.

Have your **O**sborn **B**rushing **A**nalyst help you develop and apply output-increasing ideas to *your* cleaning and finishing operations. Call now or write *The Osborn Manufacturing Company, Dept. 569, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

OSBORN

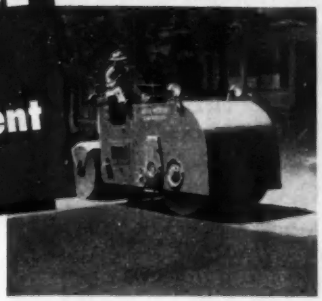
LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS



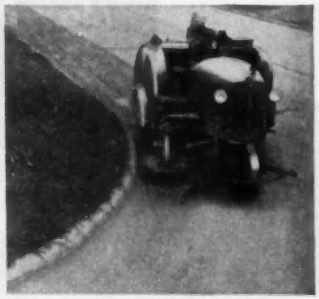
ANOTHER SIMPLE APPROACH. For small parts such as bushings, a simple forcep fixture can be devised to hold parts for power brushing. This one is made of wire.

Austin-Western "99-H" Power Grader

EXCEPTIONAL PERFORMANCE on mobile equipment



Austin-Western Tandem Roller



Austin-Western Model "40" Motor Sweeper

. . . that's why

Austin-Western *uses* VICKERS VANE TYPE PUMPS

Here are some of the reasons for the outstanding performance of the Vickers mobile equipment pump shown below . . . reasons that influenced its selection as the source of hydraulic power for Austin-Western road machinery.

Vickers Balanced Vane Pumps (single) for mobile machinery are made in 10 sizes having delivery ratings from 3.2 to 52 gpm @ 1000 psi and 1800 rpm. Higher pressures and/or speeds also possible. Several mountings and four optional positions of pressure outlet connection. Also available in double pump combinations.

1. Compact, high-efficiency design with many choices of pump size and mounting arrangement SAVES SPACE and also provides INSTALLATION SIMPLICITY.
2. Pump does not load up until engine is up to speed, for EASY COLD WEATHER STARTING.
3. All running clearances automatically maintained as pump wears; PERFORMANCE DOES NOT DROP OFF WITH WEAR.
4. Exclusive hydraulically balanced design neutralizes oil pressure loads on bearings, providing LONG LIFE WITH NO ADJUSTMENTS.
5. Rugged construction makes Vickers mobile equipment pumps TOUGH.

For further information get in touch with the nearest Application Engineering office or write to Detroit for Catalog M-5100.

VICKERS Incorporated *DIVISION OF THE SPERRY CORPORATION*

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Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

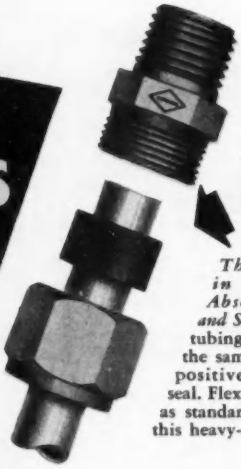
Ask for NEW CATALOG M-5100

4545

Got a tough tubing connection job?...

IMPERIAL FLEX FITTINGS

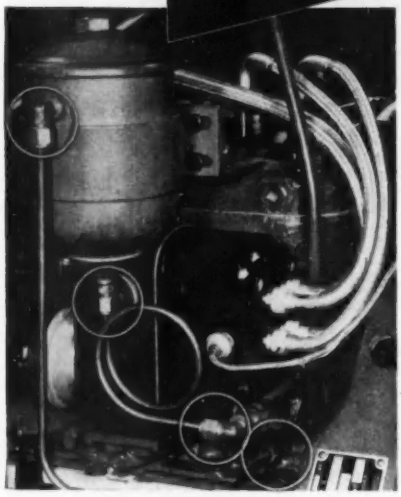
May Be the Answer

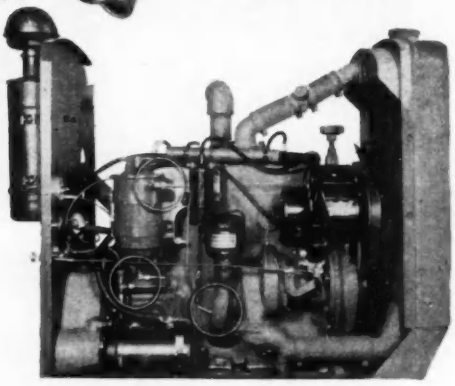


The tube coupling with vibration and shock absorbing sleeve.

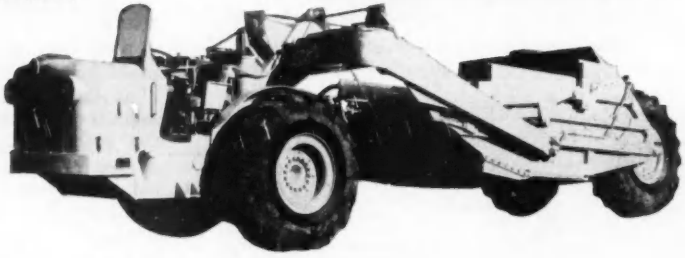
This Elastic Sleeve in Flex Fittings Absorbs Vibration and Shock . . . permits tubing to flex and at the same time assures a positive pressure tight seal. Flex Fittings are used as standard equipment on this heavy-duty engine.

Flex Fittings make joints virtually indestructible by VIBRATION . . . withstand SHOCK and MINOR TUBE MOVEMENT





Flex Fittings, circled on this engine, are very easy to install . . . simply slip nut and Flex sleeve over tubing . . . insert tubing into body as far as it will go and tighten nut—that's all.



Whether it's earth movers (illustrated), tractors, diesel engines, heavy power equipment or machinery, Flex Fittings will do the job. They have been thoroughly proved by extensive use.

Flex Fittings Can Be Used With All Kinds of Tubing

Imperial Catalog 344 gives you complete information on Flex Fittings. Ask for your copy.

THE IMPERIAL BRASS MFG. CO., 1241 W. Harrison St., Chicago 7, Illinois

IMPERIAL

PIONEERS IN TUBE FITTINGS AND TUBE WORKING TOOLS

Don't Miss the New Mallory "Nu-Wrinkle Cap"*

ELECTRODES for Resistance Welding

- Easily replaceable cap cuts costs, conserves copper
- Corrugated skirt provides positive contact with shank
- Positive alignment between cap and shank
- Makes a readily replaceable insert for welding dies
- Large cooling area in cap skirt
- Fluted** water hole in shank
- All standard Mallory nose shapes

For complete information, write direct or contact your local Mallory distributor.

Phantom view showing cap in place in shank.

*Trade Mark, Pat. Applied For **Pat. Pending

Resistance Welding Electrodes, Holders, Dies, Rod and Bars, Castings, Forgings

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

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KOPY-KAT
ROCKFORD MACHINE TOOL CO.

DUPLICATES *Complex forms*

with ease of straight-production machining

. . . on hydraulic shapers, planers and slotters

DIRECT TRANSFER — NO INTERMEDIATE MOTIONS

The Kopy-Kat is so sensitive, so exact, that positive duplication of complex forms is done with the ease of straight-production machining. Contours or full forms are produced, using inexpensive masters mounted on the cross-rail or table. A stylus transfers the form *directly* to the tool head through the patented hydraulic duplicator valve. Inaccuracies are eliminated by the absence of intermediate motions.

FAST WORK — LESS COST With the new Kopy-Kat you can turn out odd-shaped parts rapidly and economically for implements, aircraft, jet, turbine and other defense assemblies. Much time and money are saved with inexpensive masters, or by using the orignal form itself. Tooling and fixtures are greatly simplified.

Ask a Rockford Hydraulic representative to show you how the Kopy-Kat can simplify your form-machining problems. He can give you the complete story, with examples on many irregular mathematical curves and shapes.

For a quick picture send for Data Sheets No. 12.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

519 Hy-Draulic

Speed Up . . . Bring Superior Results At Low Cost

To Your **RUBBER-TO-METAL . . . ABRASIVES . . . AND REFRACTORY MATERIALS** *Bonding*

with CIBA

Ardux* 120 164

BONDING RESINS

Automotive . . . Aviation . . . and Allied Industries find new selling features and production advantages in ARDUX Resins.

Ardux resins fill a unique niche in product engineering today wherever the durable bonding of metals, (ferrous and non-ferrous), and plastics to natural or synthetic rubbers is required under extreme conditions of vibration, torque, friction, etc.

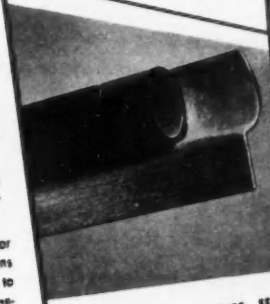
Ardux resins are also suitable for bonding wood or thermosetting materials to themselves or to each other.

Available in two forms to meet particular application requirements, Ardux resins bring superior "time-tested" properties to design development and production planning that you cannot afford to overlook.

Send for the new complete Ardux Data Folder.

SEND FOR THIS NEW COMPLETE ARDUX DATA FOLDER

ARDUX 120



REDUCES STRESS FAILURE, EFFECTS OF SHOCK LOADING. A resin emulsion of low viscosity, Ardux 120 excels in bonding metals and plastics to natural or synthetic rubbers. Typical application is this rubber tubing bonded to aluminum alloy capping strip.

(Courtesy—The de Haviland Aircraft Co., Ltd.)

ARDUX 164

HIGH STRENGTH AT HIGH TEMPERATURES. Ardux 164 is specifically formulated to simply and durably bond brake linings and clutch plates. Retains high strength at temperatures up to 250°C.

Ciba *Plastics*

FOR SUPERIOR BONDING, CASTING, COATING

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A. I.

CIBA COMPANY INC., PLASTICS DIVISION
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Please send me Ciba Plastics Technical Bulletins for

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*Name*_____

*Company*_____ *Title*_____

*Address*_____

Another Thompson First . . .

Valve Rotation with

THE Thompson ROTOCAP AND ROTOVALVE

2 WAYS TO GIVE A VALVE 9 LIVES

Increase valve life . . . put one of the two Thompson-pioneered systems of valve rotation into your engines.

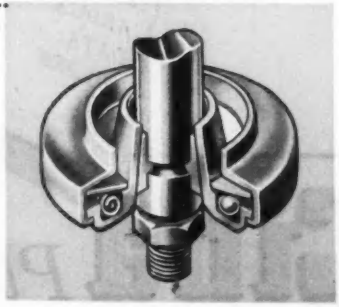
Either the field-proved Thompson Rotocap or Rotovalve systems will

- **Keep valve face and seat clean**
- **Prevent stem deposits**
- **Minimize effects of distortion**
- **Prevent local hot spots.**

ROTOVALVE or Release Type developed by Thompson Products and introduced in 1938

ROTOCAP or Positive Type developed by Thompson Products and introduced in 1946

Write for booklet describing the Thompson-developed systems of valve rotation.



VALVE DIVISION

Thompson Products, Inc.

EUCLID, OHIO

YOU CAN COUNT ON THOMPSON FOR ENGINEERING LEADERSHIP

NEW TEN-TON CARGO CARRIER Designed and built at the Detroit Arsenal, this unique Model 51 Truck-tractor features a body design of extremely light weight in proportion to its load carrying capacity. Front and rear axles operate as independent unit for fuel articulation. South Wind "winterized"—a "978" heater keeps frost off the windshield . . . freezing cold outside the cab.

NEW REO "EAGER BEAVER" Army's newest six-by-six . . . 2½ ton heavy duty utility vehicle and cargo carrier. Can travel up 60° grades or under water. A South Wind "978" defrosts windshield, keeps cab and personnel warm.

NEW "ACK-ACK" GUN CARRIAGE Mounts twin 40 mm. anti-aircraft guns. Equipped with two South Wind "978's." One for personnel heating inside, and one in the gun turret to heat the turret components.

NOW...ARMY GETS "TROPIC" HEAT AMID "ARCTIC" COLD

Amazing New Military Heater Keeps Vehicles Warm Even at 70 Below!

Hard to imagine! The mid-summer, tropic heat inside these new military vehicles while outside temperatures range from 30 to 70 degrees below. And yet it's true. The result of a revolutionary new heater—the South Wind "978."

Simplified in design. Compact. This rugged forced air heater preheats, heats and defrosts in any type of military vehicle—in temperatures as low as 70° below zero. Dependably safe because the combustion air system is completely separated from the ventilating air stream. Always fast acting because warm air circulation doesn't depend on engine heat.

Built to Army Ordnance specifications, the "978" has been widely accepted by the Army for its winterization program. And because of its many exclusive advantages, promises to be influential in guiding future designs for commercial car heating, too.

REMEMBER: This is the only heating equipment available that meets winterization specifications for Ordnance vehicles. Write or call for information regarding your requirements. Get the experienced counsel of trained South Wind engineers. Address Stewart-Warner Corp., South Wind Division, 1514 Drover Street, Indianapolis, Indiana.

STEWART-WARNER

PERSONNEL HEATING *South Wind*
ENGINE AND EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING

Deep-Drawn in 2 DRAWS with ADVANCE TOOLING

Depth Bomb part drawn with Advance Dies from 31½" steel blank.

THIS DIFFICULT STAMPING SIMPLIFIED BY NEW ADVANCE TOOLING METHOD

Here's another example of ADVANCE tooling ingenuity. The problem: This depth bomb tail piece deep-drawn to the dimensions shown above . . . in just two draws . . . from a 14-gauge steel blank. Similar pieces were formerly produced with five or six draws, or by butt-welding two halves.

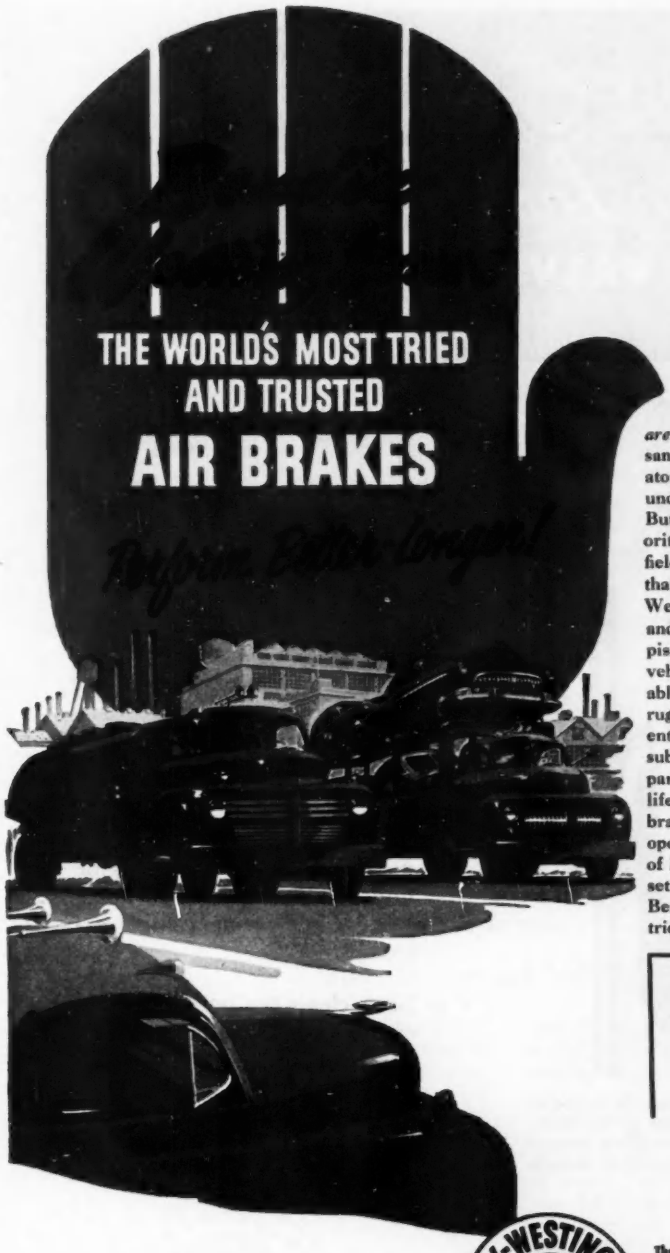
Advance tooling techniques met the requirements — with dies that produced the part in two draws as specified. Advance can help you with your difficult drawing and stamping problems . . . and save you time and money in your processing operations. Our engineers and our completely equipped die plant are ready to serve you. Consult us — or write for complete information.

Write for Illustrated Descriptive Bulletin

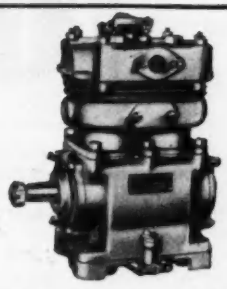
ADVANCE DIE & TOOL CO.

6800 MADISON AVENUE — CLEVELAND 2, OHIO

PHONE: WOodbine 1-9191



Peak braking performance, outstanding economy and long life dependability are no gamble when you install Bendix-Westinghouse Air Brakes on your trucks or buses—*they are a certainty.* A fact proved by thousands of the nation's truck and bus operators over billions of miles traveled under all kinds of operating conditions. But such an outstanding record of superiority, unmatched by any other brake in the field, didn't just happen—it was planned that way. For example, the Bendix-Westinghouse Compressor, planned and designed on the same reciprocating piston principle as the engines in your vehicles, has demonstrated its remarkable durability time after time with rugged, reliable service throughout the entire life of the vehicle itself! Add the substantial savings on maintenance and parts replacement costs to this extra long life and you can see why these mighty brakes are first choice with truck and bus operators everywhere! Take advantage of it—when you specify Air Brakes don't settle for a second choice — specify Bendix-Westinghouse, the world's most tried and trusted air brakes!



The Bendix-Westinghouse Compressor—heart of the air brake system—performance proven over more miles on more installations than any other compressor available!

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY
ELYRIA, OHIO

BENDIX-WESTINGHOUSE AIR BRAKES
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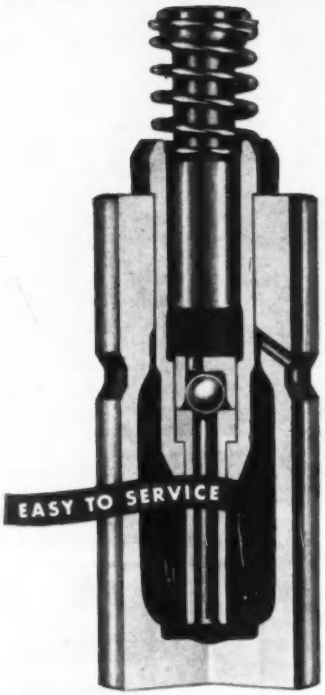
EATON
Zero-Lash
Registered U.S. Patent Office
HYDRAULIC VALVE LIFTERS

FREEDOM from VARNISH



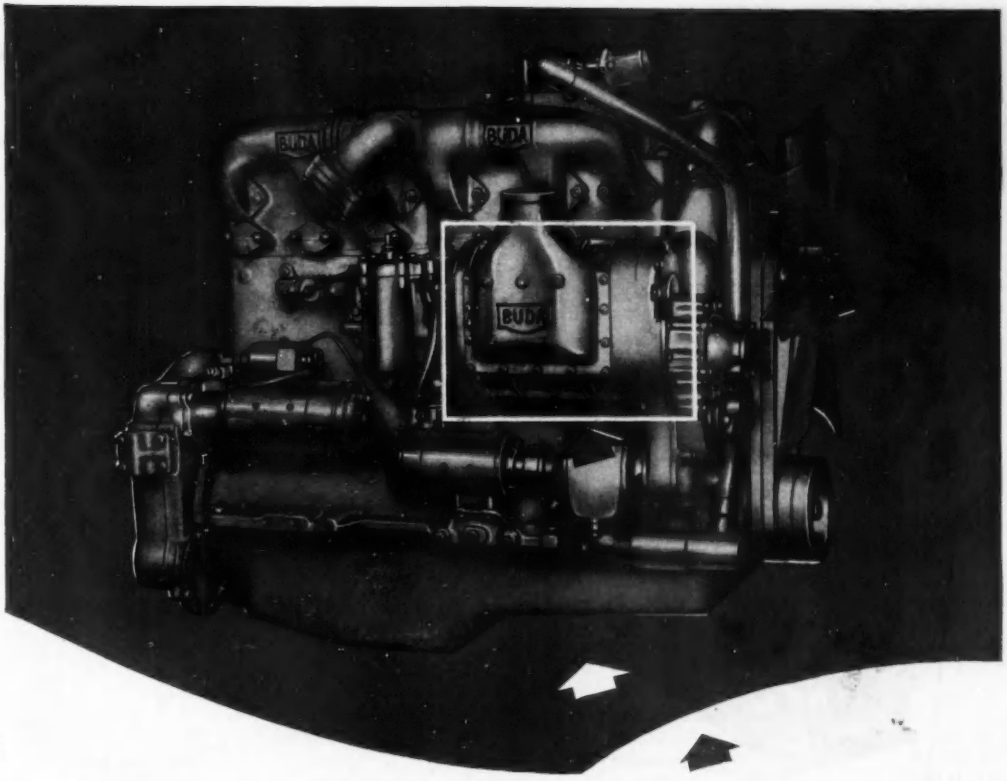
Eaton Engineers welcome the opportunity to discuss application of its multiplicity of hydraulic valve lifter designs to engines proposed or now in design.

- ★ Eliminate efficiency impairment from varnish and sludge.
- ★ Provide perfect tappet adjustment for the life of the engine under all engine operating speeds and temperature extremes.
- ★ Zero clearance permits better cam design for optimum engine performance.
- ★ Silent valve train operation.
- ★ Smoother idling.

EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

SAGINAW DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves - Tappets - Hydraulic Valve Lifters - Valve Seat Inserts - Jet Engine Parts - Rotor Pumps - Motor Truck Axles - Permanent Mold Gray Iron Castings - Heater-Defroster Units - Snap Rings Springtites - Spring Washers - Cold Drawn Steel - Stampings - Leaf and Coil Springs - Dynamatic Drives, Brakes, Dynamometers



BUILT-IN POWER

BUDA Diesels use B-W Superchargers built in for added horsepower and economy

The Buda Company of Harvey, Illinois, uses B-W Superchargers on their diesels. This automotive diesel engine, Model 6-DAS-844, develops 280 brake horsepower at 2,100 r.p.m. Designed for heavy-duty truck operation both at sea level and altitude. The supercharger on this engine is one of a standard line developed by Pesco Products Division.

For motor truck, marine, railway or general industrial applications, supercharging means savings in engine space and weight . . . means power to pull heavy loads . . . means sea level operation at high altitudes. All these extra benefits without corresponding increases in operating costs.

The engine manufacturer who wants to pack more power into a given engine size . . . or who wants to add an entire new series of models to his line without retooling or the expense of redesign, can do so simply by equipping his present line with B-W Superchargers. One of our engineers will gladly explain how this can be done. There is no obligation. Write today to:

engineering Pesco production

PRODUCTS DIVISION

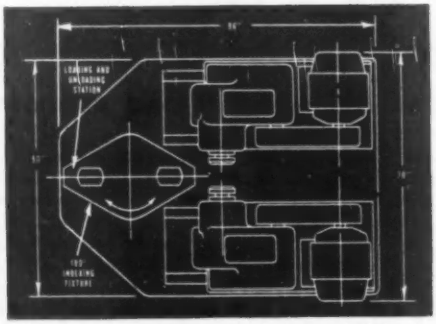
BORG-WARNER CORPORATION

24700 NORTH MILES ROAD BEDFORD, OHIO

A New Concept - DUPLEX PRODUCTION Milling Machines as Developed by MOTCH & MERRYWEATHER

Great power and rigidity are transmitted at the tool point. Right-hand and left-hand milling heads rapid traverse approach, feed, and rapid return. The rotary index table carries two sets of workholding fixtures and is positively locked at the milling station. Here is the essence of rigidity.

M. & M. Duplex Production milling machines fit easily into conveyorized production lines. Parts are loaded and removed at one station. Production: 268 tractor side bars per hour at 100%.



Drawing above shows general design of Motch & Merryweather Duplex Production Milling Machine.

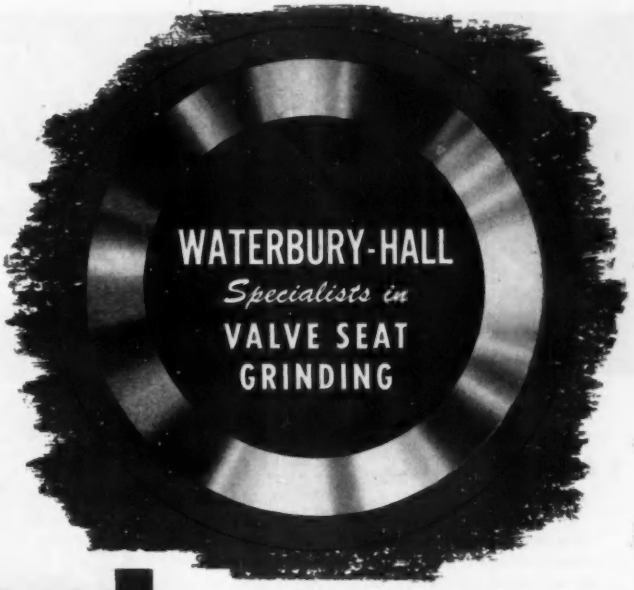
With this Motch & Merryweather single-purpose production milling machine the two heads move, not the operator. There is no milling table to move. Let us tell you why greater rigidity and power (30 h. p.) will jump your production. Fixtures can be changed within certain limitations to suit your requirements. Your part drawings will receive our prompt attention.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

- **BETTER VALVE SEATS** — faster with **WATERBURY-HALL** grinders
- **COMPLETE LINE** production type and service shop equipment
- **ENGINEERING** facilities for your valve seat grinding problems



CAR & TRUCK ENGINE PRODUCTION

The nation's leading automobile and truck producers precision grind all valve seats automatically, in as little as 60 seconds, block to block, on WATERBURY-HALL vertical or "V" type Multiple Spindle Grinders.

AIRCRAFT ENGINES

For production or service, WATERBURY-HALL Wet Type Valve Seat Grinders effectively overcome common problems presented by physical properties of current seat materials and by the frequent inaccessability of seats themselves.

DIESEL POWER

The WATERBURY-HALL Diesel Valve Seat Grinder is specifically designed to give, without jamming, the perfect seats necessary for high compression engines — in either production or service.

WATERBURY TOOL DIVISION VICKERS INCORPORATED A SUBSIDIARY OF THE SPERRY CORPORATION **162 AURORA ST., WATERBURY 20, CONN.**

KELSEY-HAYES

Advanced Design

3 pc. Truck Wheel

...ARE SAFEST and EASIEST TO SERVICE

Kelsey-Hayes 3 piece, wide-base truck wheels have the exclusive KH locking device recognized by truck manufacturers and service men everywhere as the safest ever devised! The more the tire exerts pressure, the tighter the retaining ring locks the side flange to the base rim. Yet tire mounting, demounting, and tube servicing is simple!

"HEY GEORGE! WHAT IF THAT RIM LOCKING-RING LET'S LOOSE AT YOU?"
"YOU DON'T HAVE TO BE AFRAID OF THESE KELSEY-HAYES RIMS, BILL! THEY'RE THE SAFEST!"

Available in all popular sizes for leading makes of trucks.

KELSEY-HAYES WHEEL COMPANY

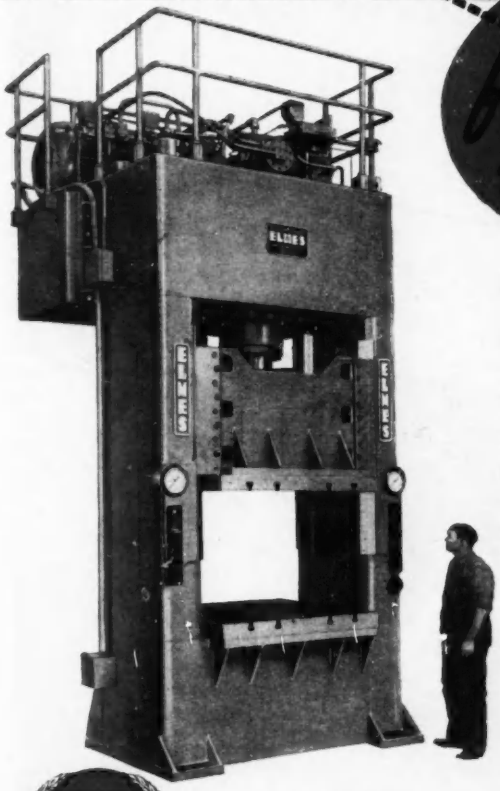
DETROIT 32, MICHIGAN

PRODUCTS: Wheels—Hub and Drum Assemblies—Brakes—Vacuum Brake Power Units—for Passenger Cars, Trucks, Buses—Electric Brakes for House Trailers and Light Commercial Trailers—Wheels, Hubs, Axles, Parts for Farm Implements.
PLANTS: Kelsey-Hayes Plants in Michigan (4); McKeesport, Pa.; Los Angeles, Calif.; Davenport, Iowa; Windsor, Ontario, Canada.

ELMES' SOLID CENTURY OF ENGINEERING EXPERIENCE

means

faster, lower cost metal-working!



300-ton ELMES Drawing and Forming Press equipped with 2 Pressure Cycles

The Elmes Hydraulic Equipment produced today represents the accumulated experience of one hundred years of progressive engineering. Since 1851, and from the very pioneering days of hydraulics, Elmes equipment has meant dependable, economical performance.

The new press shown here is typical of Elmes *specialized design*. Developed specifically for the manufacture of plow beams, this press has a special hydraulic circuit providing *two pressure cycles in one*. Operation is by electrical control, using two foot switches. By actuating one foot switch, the ram is made to exert low tonnage for bending the plow beams to a specific angle; the beams are then turned and flattened under high tonnage by operating the other foot switch. The press is arranged for pressure reversal as well as position reversal.

Conveniently located controls speed press operation and die set-up time. Limit switch controls are operated by means of a simple hand crank. Inching-down handwheel permits the operator to move the platen as little as 1/16" at a time—a great aid to precise control in die-setting. A desirable safety feature is a thermostat control which will stop the press operation in the event hydraulic fluid should reach a critical temperature.

Let Elmes' solid century of engineering experience be *your* guide to better, faster, lower cost metal-working. Write now for Bulletin 1010-B, "Elmes Metal-Working Presses."

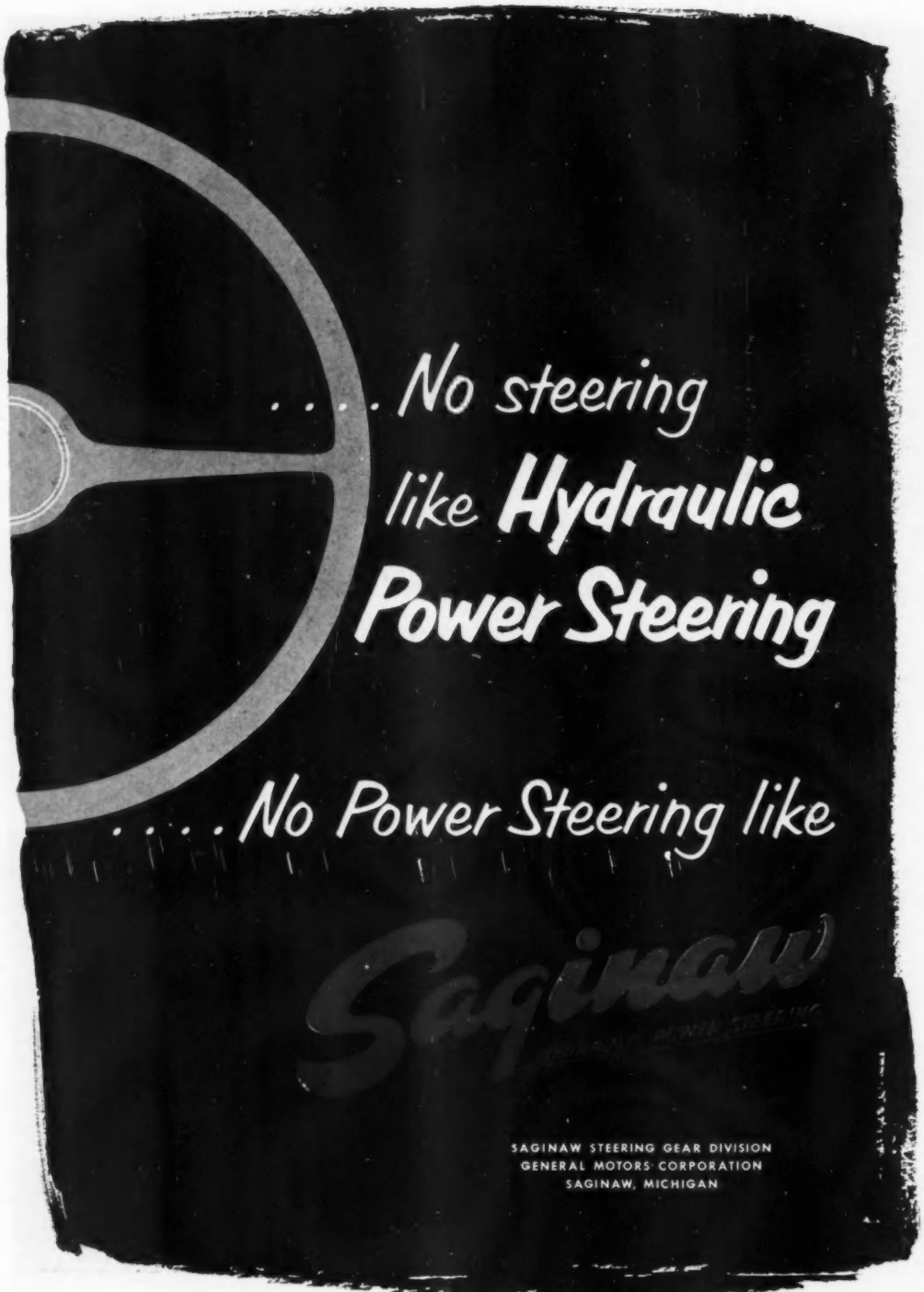
ELMES HYDRAULIC EQUIPMENT

American Steel Foundries

ELMES ENGINEERING DIVISION

"Think they'll still run on gas in 1960?"
It's anybody's guess whether 1960 cars will be jet propelled, atomic-powered, or still running on gasoline. One thing is certain, though—these future cars will be *better* cars! They'll be safer . . . more comfortable . . . more efficient.
Why? Because, among other reasons, 1960 cars will have improved *castings*. Improvements are being made right now in the design of *cast* camshafts, cylinder blocks and heads, and pistons. They are being given greater strength, more wear resistance, and better machinability through developments by the largest independent contracting foundry in the world—Campbell, Wyant and Cannon—*where advanced metallurgical engineering, precision control, and mechanized production assure the highest quality castings at lowest cost.*
CAMPBELL, WYANT AND CANNON FOUNDRY COMPANY . . . SERVING THE AUTOMOTIVE, FARM EQUIPMENT, RAILROAD AND MARINE INDUSTRIES AND THE ARMED FORCES
CAST CYLINDER HEADS AND BLOCKS
CAST PISTONS
CAST CAMSHAFTS
CAST CRANKSHAFTS
CAST GEARS
CENTRIFUGALLY CAST CYLINDER LINERS
CENTRIFUSE BRAKE DRUMS
CWC
Since 1908
MUSKEGON, MICHIGAN

We specialize in the production of sleeve bearings and parts with bearing properties.
Within our six-plant manufacturing organization, our products range from simple spacer tubes to big, precision bearings weighing hundreds of pounds each. We work with babbitt, copper-lead, bronze, steel, brass, aluminum or silver—in standard or special alloys to meet exact specifications.
All production rigidly quality-controlled. Research and engineering facilities available without obligation. FEDERAL-MOGUL CORPORATION, 11037 Shoemaker, DETROIT 13, MICHIGAN
Since 1899
FEDERAL-MOGUL



Hydraulic Power Steering for Cars . . . Trucks . . . Buses . . . Tractors . . . Earth Movers . . . Military Vehicles

Tires that go to school

Buses carry kids to school; make trips to town easier for the housewife; make cross-continent transportation inexpensive, fast. Their payload depends on top notch pneumatic tires. And vital to tire economy and safety is the valve that *locks* the air in the tire.

Schrader . . . the top valve producer . . . works with and for all tire manufacturers in continuing research and development. Schrader backs product leadership with production capacity—capacity that provides the major source of supply for rubber manufacturers.

A. SCHRADER'S SON, BROOKLYN 17, N. Y.
Division of Scovill Manufacturing Company, Incorporated

Schrader
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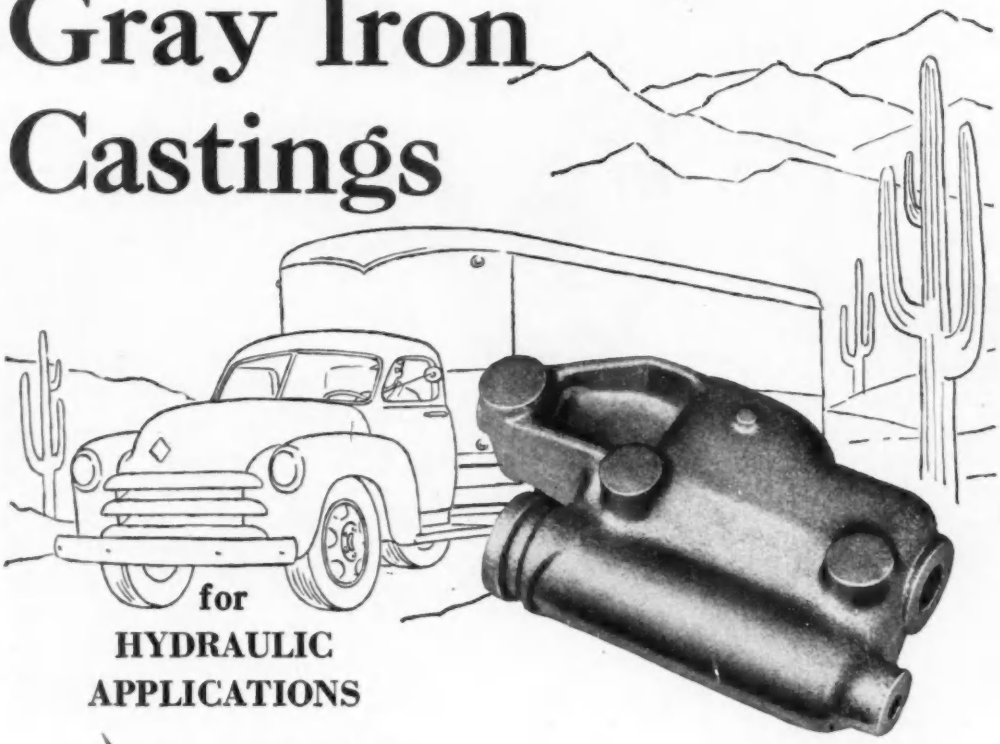
FIRST NAME IN TIRE VALVES
FOR ORIGINAL EQUIPMENT AND REPLACEMENT

Eaton Permanent Mold Gray Iron Castings



for HYDRAULIC APPLICATIONS

- **Free machinability**
- **Dense, homogeneous structure**
- **Freedom from leakage under pressure**
- **Machines to high, mirror-like finish**
- **Properly annealed; no growth or distortion after machining**

Send for your copy of the illustrated booklet, "A Quick Picture of the Eaton Permanent Mold Process for Producing Gray Iron Castings."

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

FOUNDRY DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Grinding Problem?

Black & Decker Bench and Portable Grinders speed up a wide range of jobs!

Quality-built models to suit your needs, give long service!

BLACK & DECKER Grinders do *more* jobs because of their surprising versatility and "tailored-power" B&D motors—do them *better* because of their real quality construction! B&D Bench Grinders give you dependable, B&D-built constant-speed motors; streamlined design for more work clearance; adjustable U-shaped tool rests for better support; strong steel wheel guards for extra safety. B&D Portable Grinders give you perfect balance for easier handling; splined gear mountings for perfect power transmission; steel bearing inserts for smooth running; complete abrasive dust protection for vital parts; extra-safe welded steel wheel guards.

Whatever your problem, see your nearby B&D Distributor *first* for expert help—and for eye-opening demonstrations of timesaving, cost-cutting B&D Tools! Write for free catalog to: THE BLACK & DECKER MFG. CO., 635 Pennsylvania Ave., Towson 4, Maryland.

BD Black & Decker PORTABLE ELECTRIC TOOLS

Chilton Automotive Lists

CHILTON AUTOMOTIVE LISTS contain nearly 182,600 names.

More than 130,000 changes are made on these lists each year.

More than 35,000 names are dropped and added.

More than 50,000 names and addresses are changed.

Approximately 75 people work on them constantly, using every known means of mailing-list maintenance, from personal calls to clipping services.

CHILTON AUTOMOTIVE LISTS cover the major divisions of the automotive industries:

Car Dealers
Truck Dealers
Combination Car and Truck Dealers
Independent Repairshops
Automotive Wholesalers
Truck Fleet Operators
Automotive Industrial Executives

Mailings to these lists guarantee direct mail users the highest possible percentage of delivery to individuals and outlets in business today at the addresses supplied.

Such results are the reason for the almost universal use of CHILTON Daily-Corrected LISTS by large and small users of Direct Mail throughout the various branches of the automotive industries.

Write for free data file.

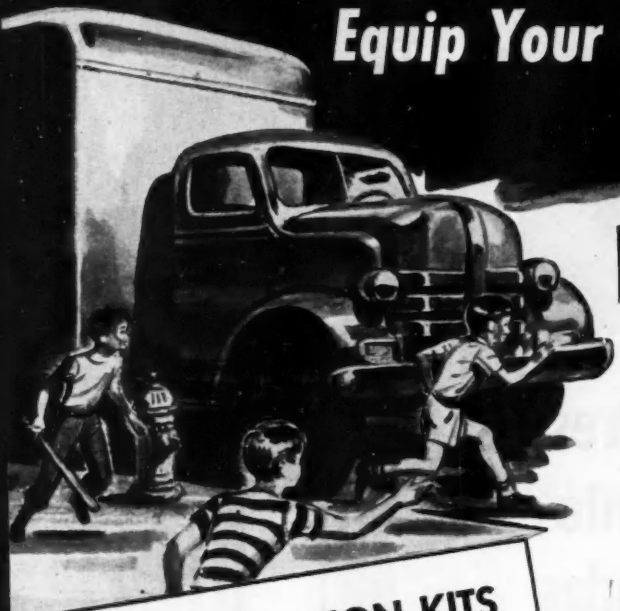
Direct Mail Division

CHILTON COMPANY

Chestnut & 56th Sts. ***Philadelphia 39, Pa.***

For QUICK STOPS

Equip Your Vehicles with . . .



MIDLAND AIR BRAKES

WITH

Husky 7.4 Cu. Ft. AIR COMPRESSOR

The big, powerful Midland Air Compressor puts tremendous thrust back of Midland Air Brakes. Here's braking force that gives new meaning to the words *safety* and *dependability*. Here's positive control for any load—on the straightaway, on curves or steep grades.

Unique, patented precision compressor inlet valves provide tremendous output.

Governor is an integral part of compressor, operating directly on the inlet valves.

The driver is always sure of sufficient reserve power for any emergency.

Midland's fully-compensating valve construction has been incorporated in the new Air Hy-Power. Fine graduation and brake pedal "feel" are provided, similar to that in passenger car brakes.

Investigate the merits of Midland Air Brakes. See the Midland Distributor near you, or write or phone to us in Detroit.

FIELD INSTALLATION KITS

Midland Air Brake Kits are specially designed to accommodate most popular makes of trucks, tractors and trailers.

These kits incorporate Midland's new Air Hy-Power unit with special brackets and all parts and fittings necessary to insure long, dependable service.

Midland Kits are so well illustrated that any mechanic can easily make installation by following the diagrams furnished.

The **MIDLAND**

STEEL PRODUCTS COMPANY

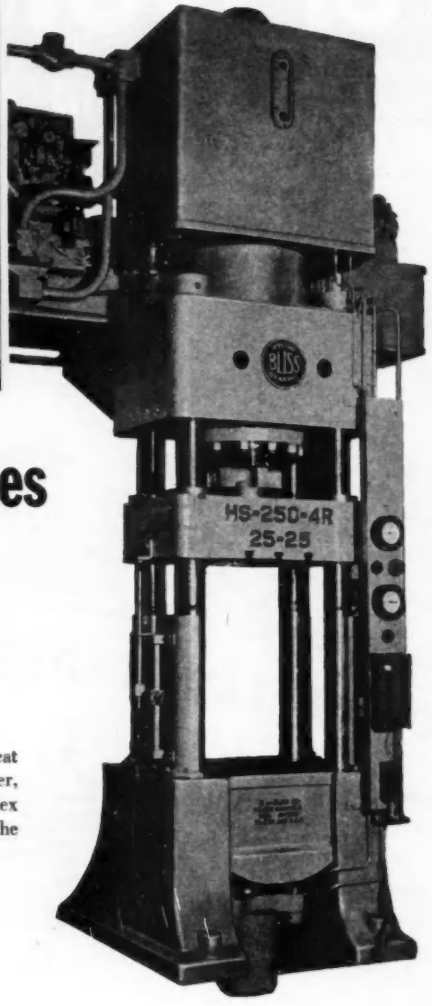
6660 Mt. Elliott Ave. • Detroit 11, Mich.

Export Department: 38 Pearl Street, New York, N. Y.

Air and Vacuum POWER BRAKES

World's Largest Manufacturer of AUTOMOBILE and TRUCK FRAMES

Air and Electro-Pneumatic DOOR CONTROLS



8 Bliss Hydraulic Presses form iron powder into complex turbine blades

Intricate aircraft turbine blades, particularly complex due to the great change required from body to root, are molded from iron powder, coined and straightened in special Bliss hydraulic presses with duplex actions at Thompson Products, Inc. Thompson's engineers credit the process and Bliss presses with these advantages:

(a) *Conserving critical metals and materials*

(b) *Minimizing machining requirements*

(c) *Holding tolerances to ±0.003 in. to airfoil contour... ±½ degree of twist*

(d) *Excellent tool life—tool steel dies deliver up to 250,000 parts*

(e) *Require relatively light pressures*

Features of the Bliss hydraulic presses include dual flow pumps, rapid advance and return speeds, variable pressing speeds, automatic reversal, automatic speed change, overload protection, plus numerous other safety devices and construction refinements.

Bliss has led the way for years in the development of presses to form metal powders...has installations in leading plants using the technique. This experience is yours when you call on Bliss with your equipment problems.

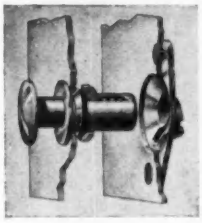
E. W. BLISS COMPANY, Canton, Ohio

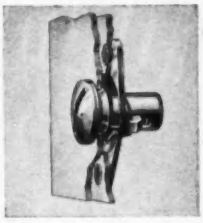
Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

From a Single Press for a Given Job...to a Complete Press Room...

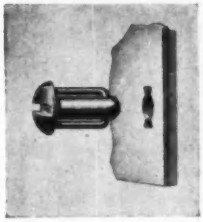
It's Bliss

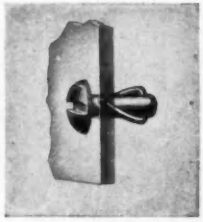
3 ways to save on assembly costs



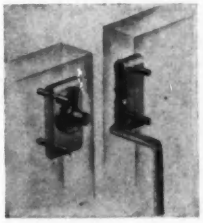


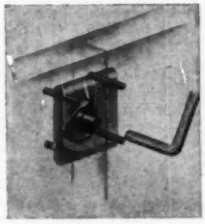
QUICK-LOCK For fastening removable access doors and panels. Because of its ease of installation, QUICK-LOCK is ideal for assembling removable panels. A 90° turn locks it in place. Stud is self-ejecting when unlocked; visual inspection shows whether fastener is locked. Spring loading takes initial load; solid supports carry increased load. Available in a wide range of sizes.





SPRING-LOCK One-piece fastener for blind holes has load-carrying steel spring wire. Spring steel arms lock fastener securely, prevent loosening under vibration. SPRING-LOCK will work with varying panel thicknesses, locks with a twist of the wrist. SPRING-LOCK is now available in high-impact plastic. The molded design permits heads to be made in various shapes for refrigerator shelf supports, washer knobs, brackets. Available in a wide variety of shapes and sizes, and also in custom designs.





ROTO-LOCK Serrated, tapered cam is engaged by formed lug as fastener is locked. Cam action draws panels together tightly, insures locking even under conditions of misalignment. Opens easily for demounting. ROTO-LOCK carries heavy tension and shear loads; can be used for air and water-tight seals; recesses completely into panels. Solidly built without springs or delicate mechanical parts, unaffected by arctic temperatures or field service.

Simmons Fasteners are widely used in refrigerators, washing machines, electrical equipment, electronic assemblies, prefabricated portable shelters, coolers, demountable furniture. Every Simmons Fastener is a service-proved design with a long record of assembly-cost saving in many industries.

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SPRING-LOCK
ROTO-LOCK

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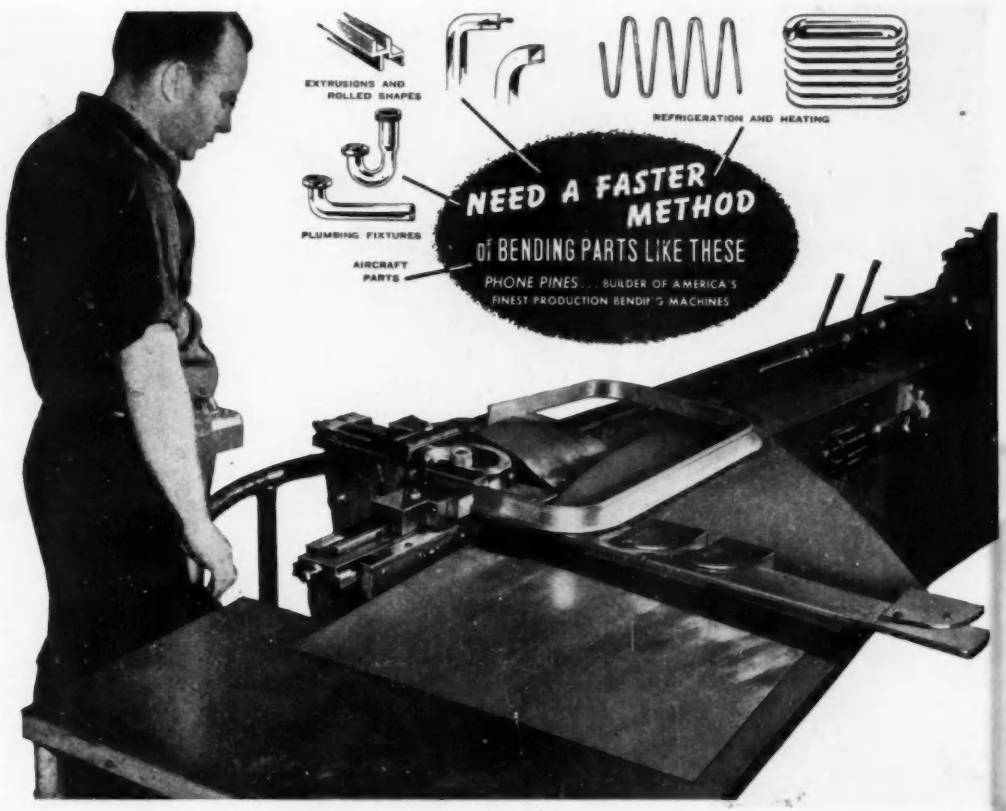
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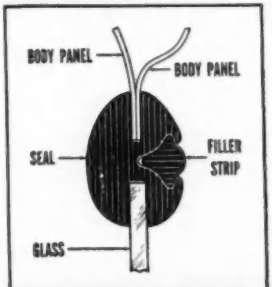
General Motors Corporation, Dayton, Ohio



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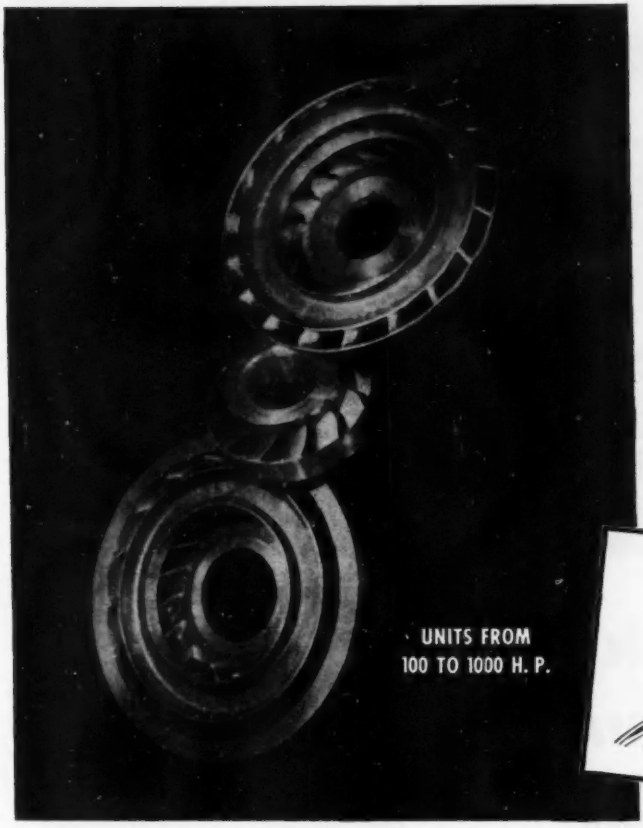

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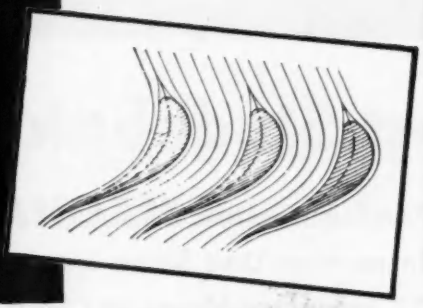

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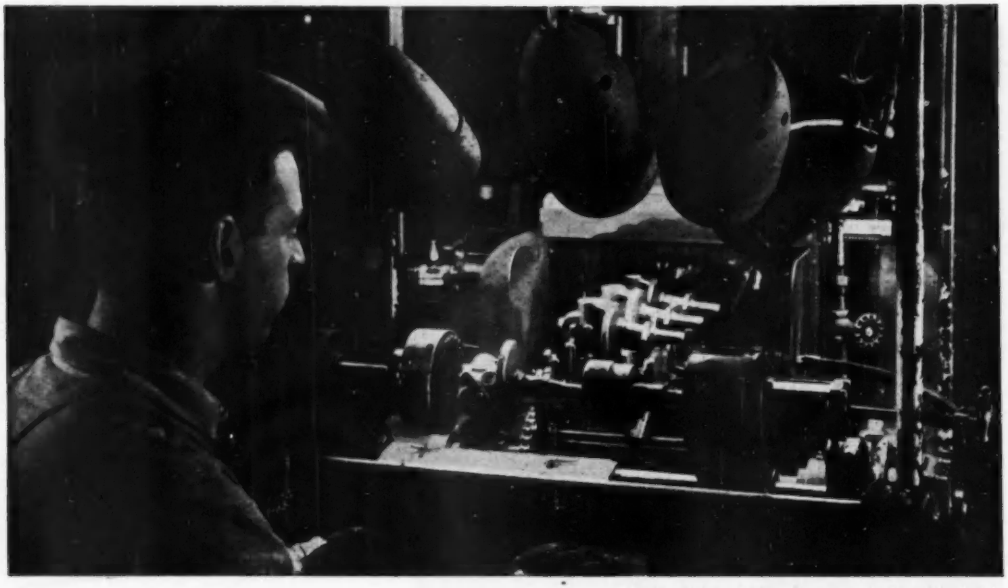

Inspection station of Magnaflux-Magnaglo Type MAL-3 Unit. Parts are loaded onto unit's endless conveyor and automatically processed with Magnaglo. Pertinent defects show up, marked with a glowing fluorescent indication under black light.

at Studebaker

Semi-Automatic MAGNAFLUX* Inspection Unit Saves Up to 32 Inspector-Hours per Shift . . .

100% INSPECTION at PRODUCTION LINE SPEED!

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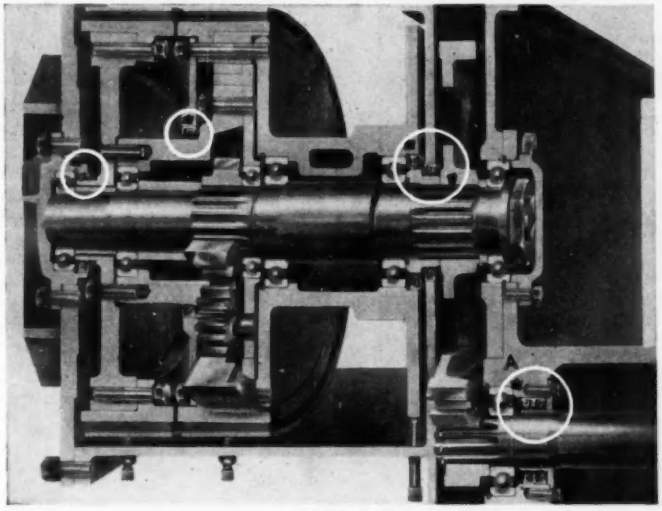

Fig. 1 — Cut-away drawing of Hyster HySpeed Winch showing position of six oil seals.

Adoption of stock designs and sizes of oil seals often effects economy for varied production runs

Appreciable savings can be achieved on varied production runs when the product design can take full advantage of stock types and sizes of oil seals. Many times only slight modification of housings and shafts will make these savings possible with no sacrifice in machine efficiency and performance. A good example is the Hyster HySpeed tractor winch shown in cut-away drawing Fig. 1.

On the surface a tractor winch appears to be a simple mechanism. Actually, because of the rather grueling and varied performance requirements, it becomes a rather complicated device incorporating two separate gear cases,

Fig. 2 — National 50,000 series leather oil seal.

a clutch and seven ball bearings. Obviously, performance depends largely upon the effectiveness of the oil seals which protect these bearings and gears.

In this Hyster Winch, a total of six stock-design National 50,000 series single-lip, spring-loaded, leather oil seals (Fig. 2) are employed. They range in size from 2⅜" to 6½" shaft size. Two of these seals are mounted back to back on the pinion shaft (A) to fulfill the function of a dual-lip seal and thus obviate the necessity for special tooling.

Aside from these "dual-mounted" seals no two of the other four are of the same size and yet each is a standard-size seal produced from existing tools. As can be seen from a study of the drawing, the simplicity and soundness of the machine design permits the utmost of flexibility with respect to the I.D. and O.D. of the oil seals.

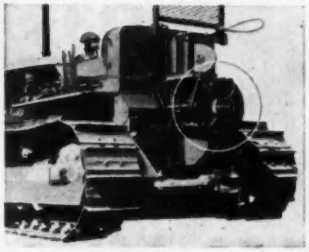

Fig. 3 — Hyster HySpeed Winch on typical track type tractor.

Perhaps you can make similar savings in the designs on which you are presently working. A thorough check with National engineers will be well worth your while. If, however, special designs are necessary we will be glad to place our experience at your disposal.

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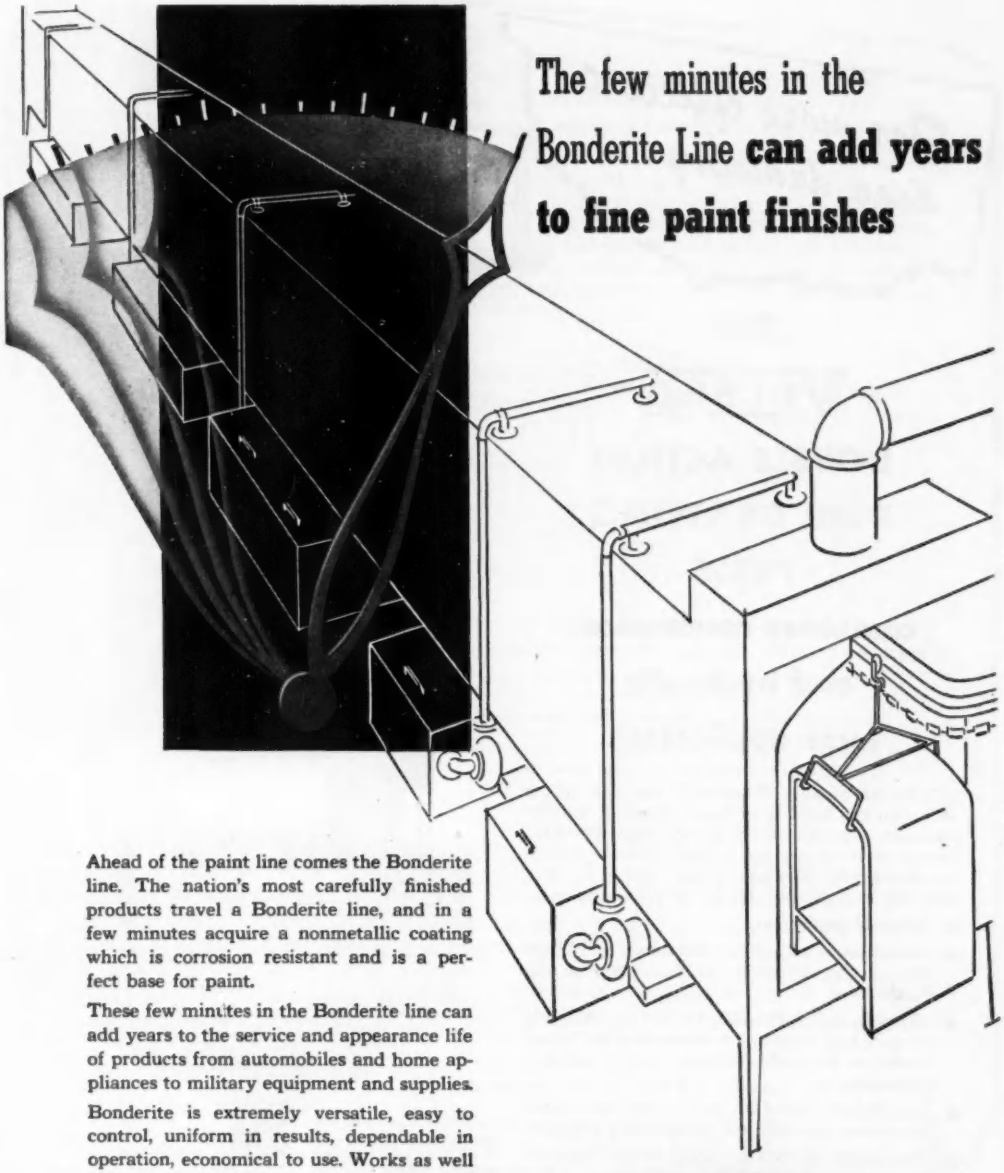

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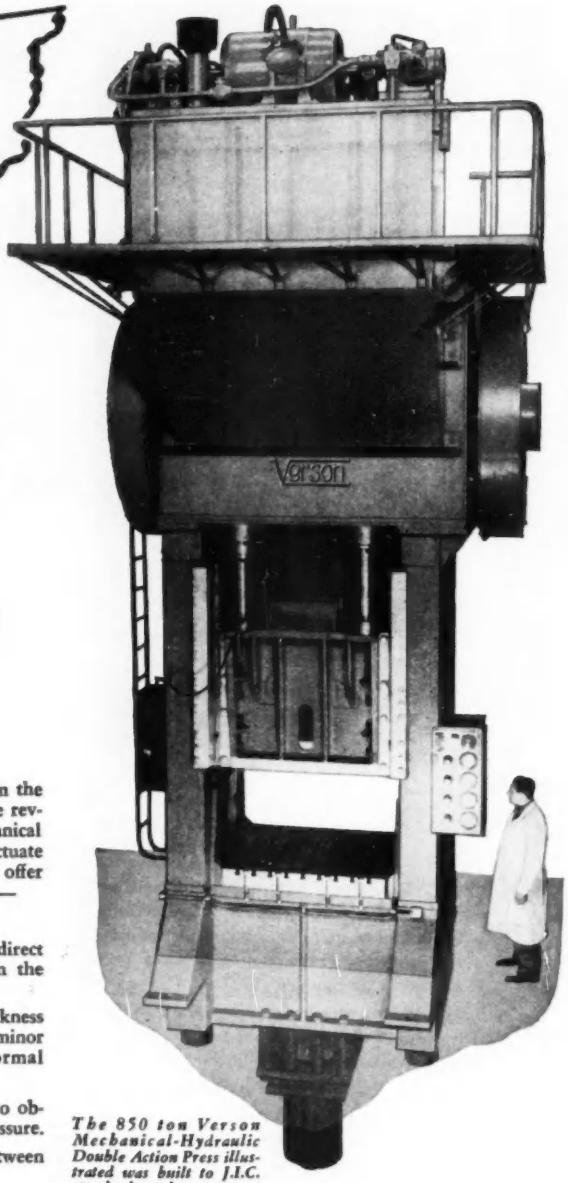

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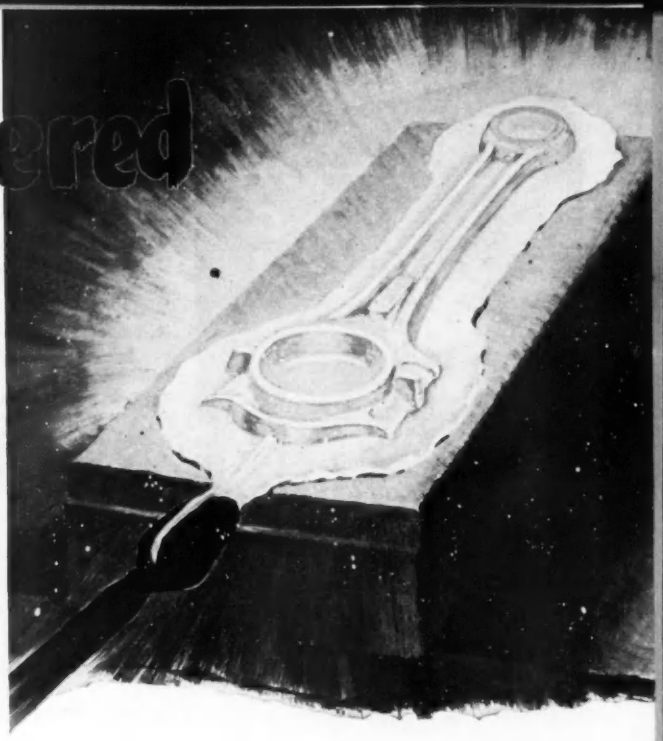

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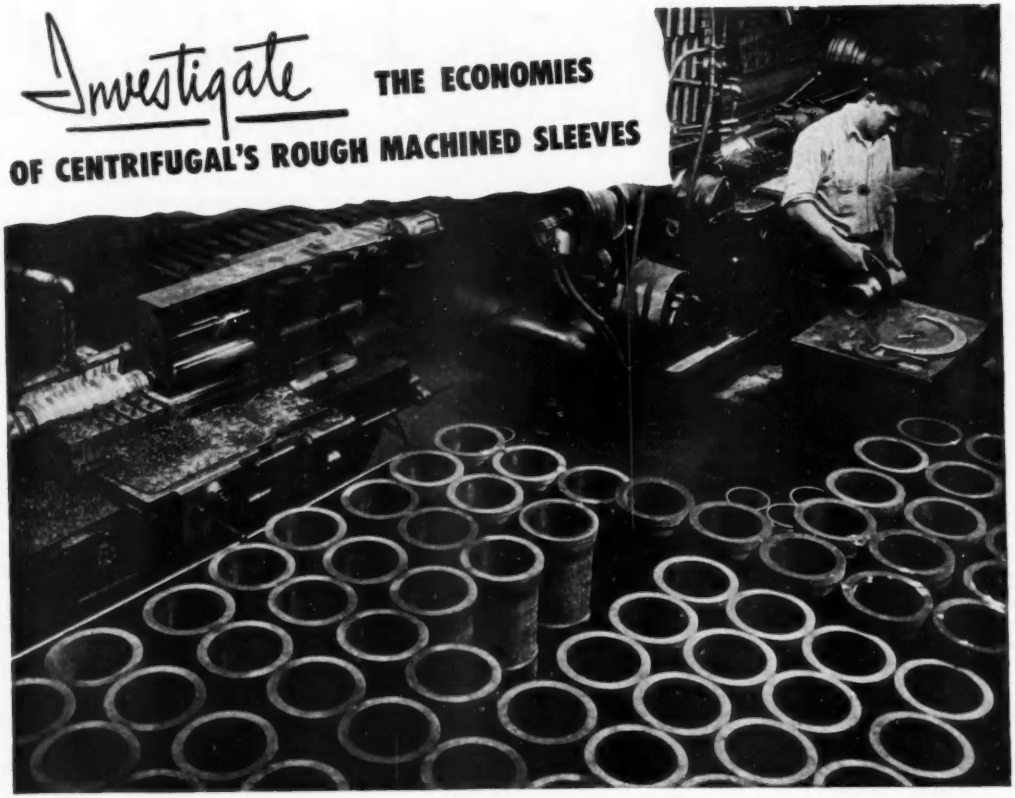

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The machine, fixture and broaches to broach the rifling grooves on recoilless shells are all American-engineered — typical example of complete American engineering from start to finish.

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American engineers designed the lead bar attachment with driving lugs which contact the shell during the push down operation causing the shell to rotate during the broaching stroke.

The BROACHES

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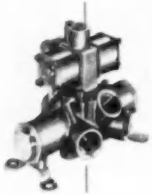

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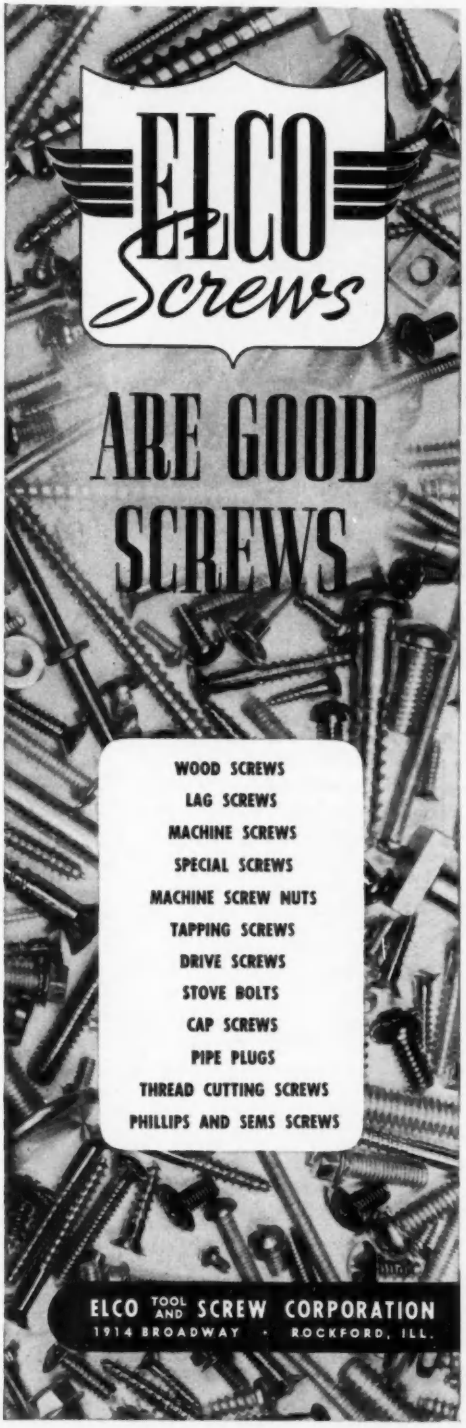

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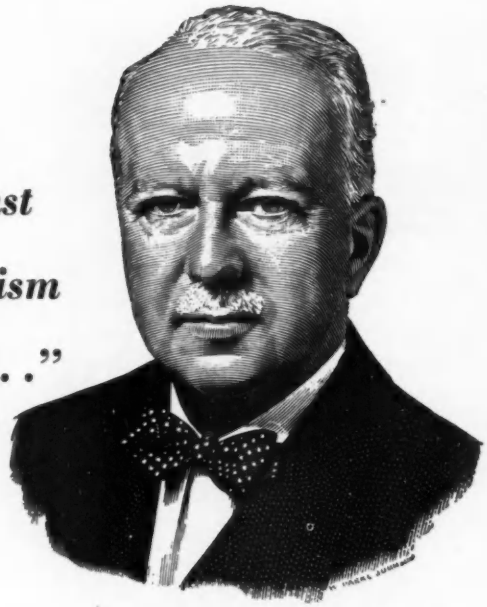

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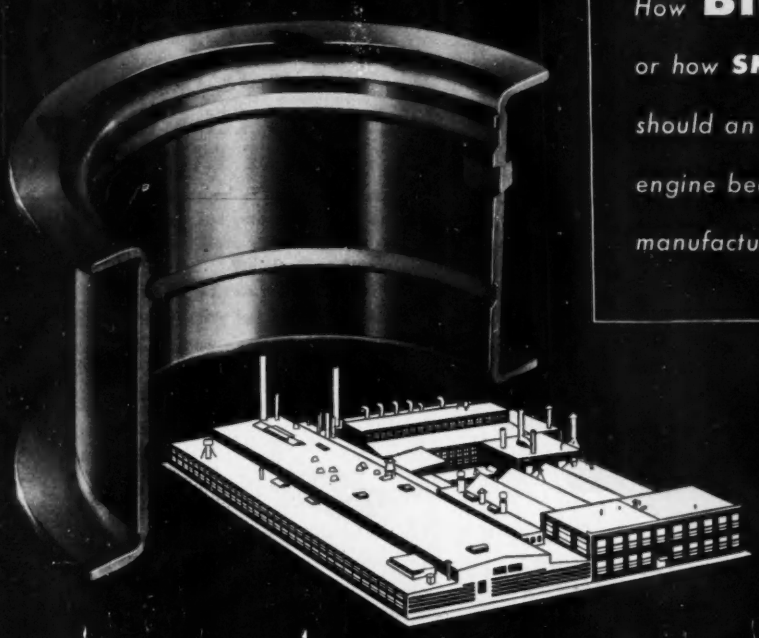

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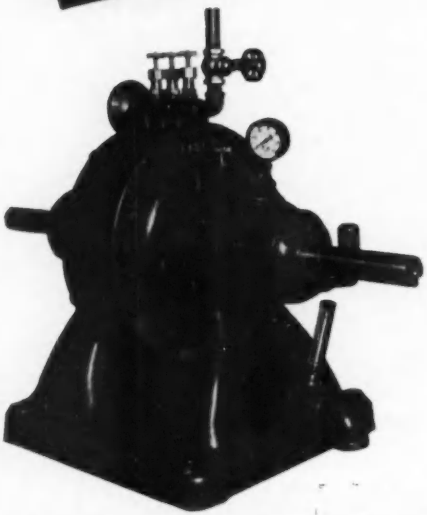

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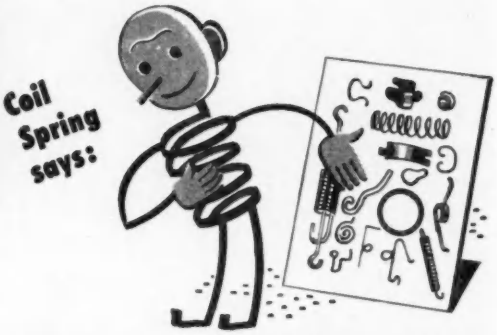

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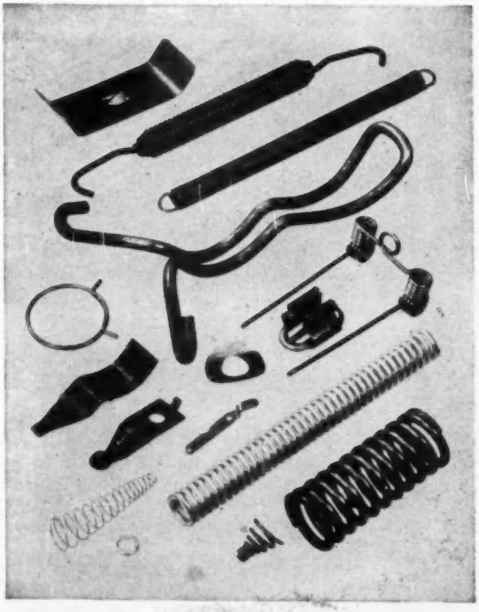

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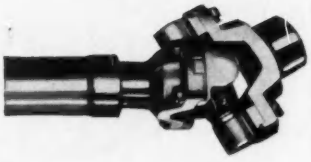

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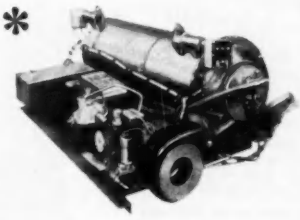

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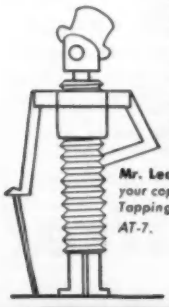

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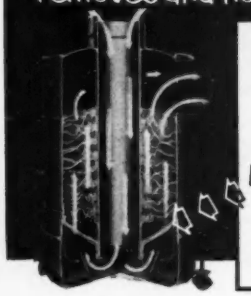

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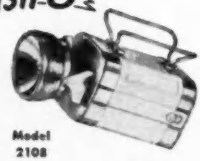

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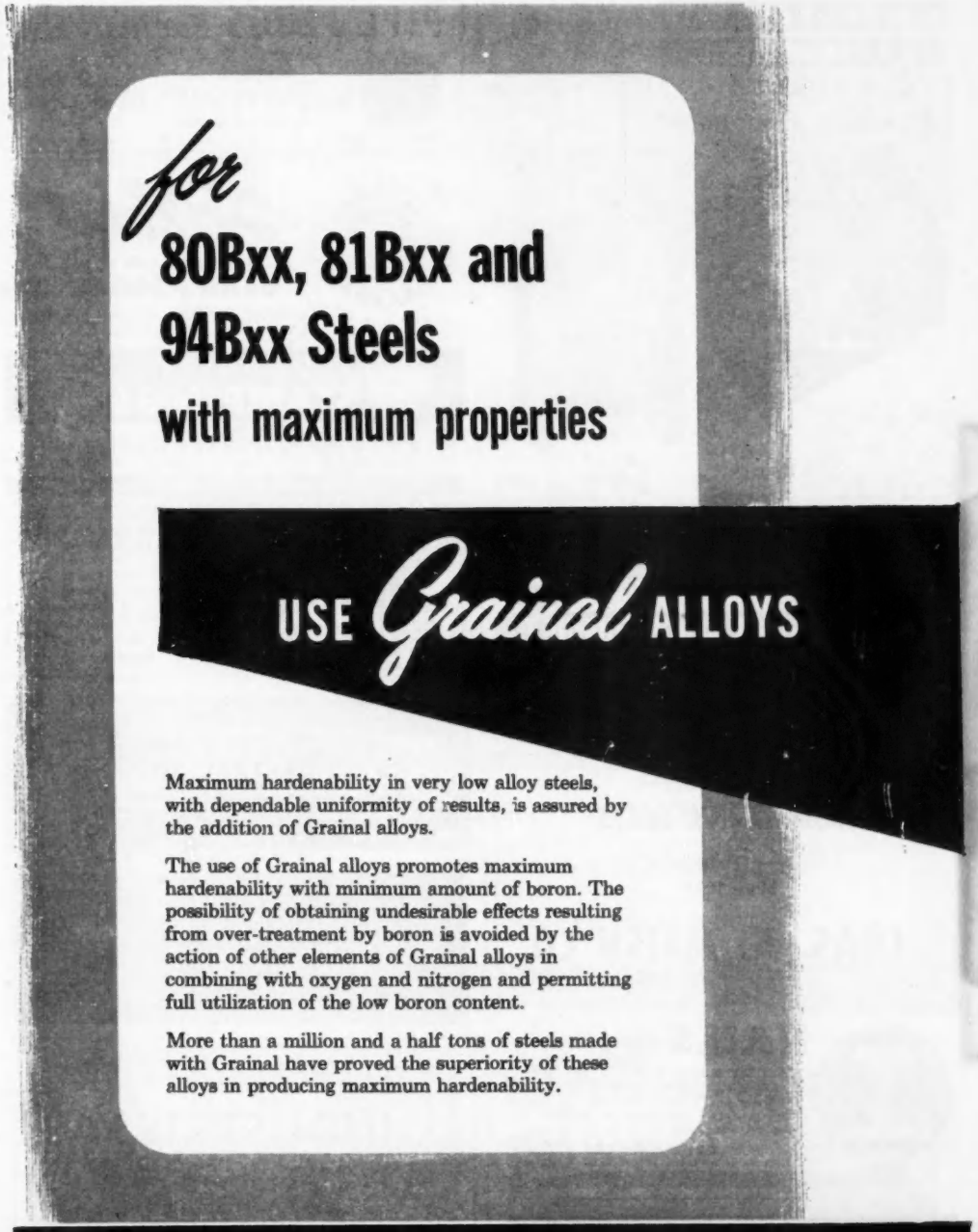
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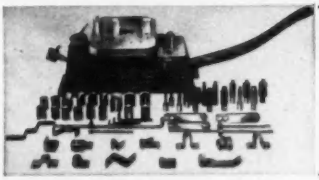

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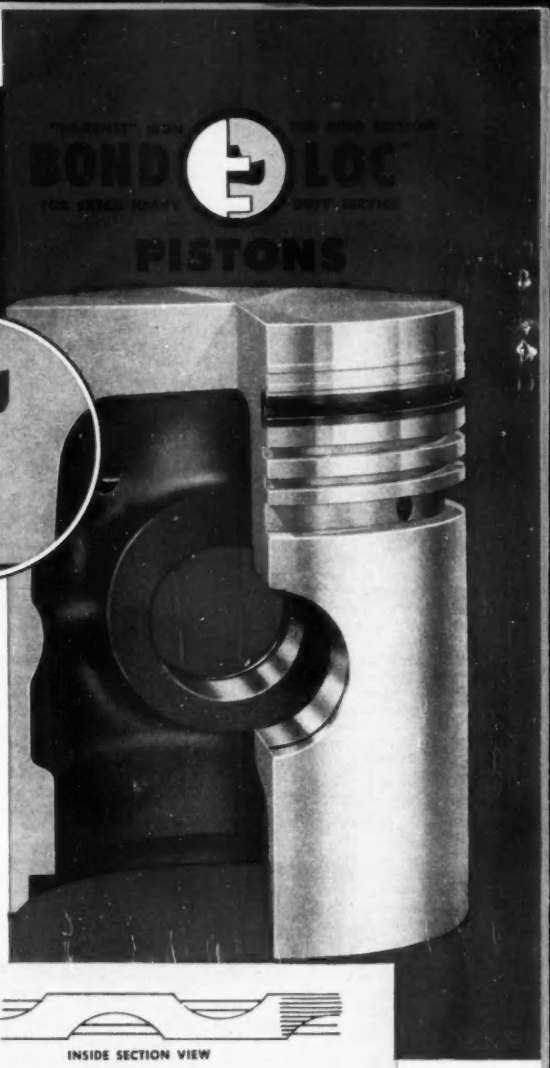

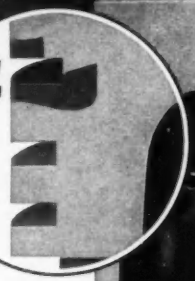

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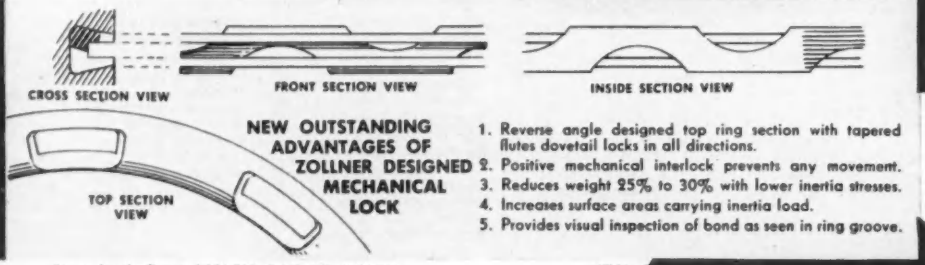

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$$Value = \frac{quality + service + public\ acceptance}{price}$$

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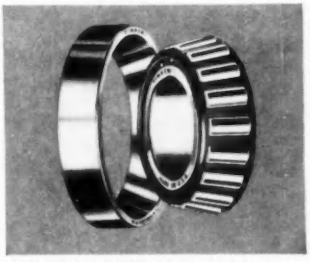

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